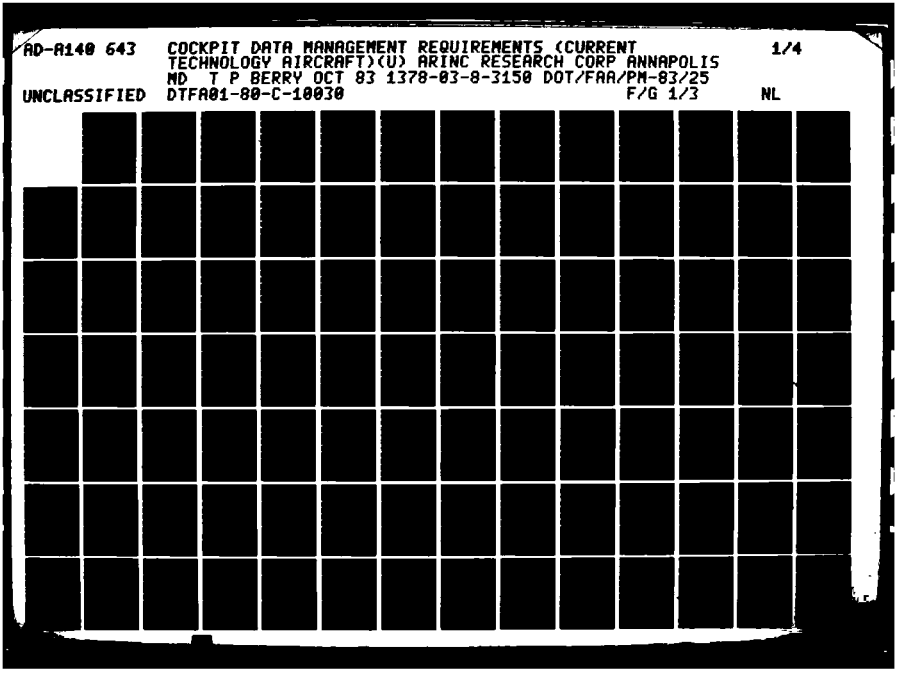
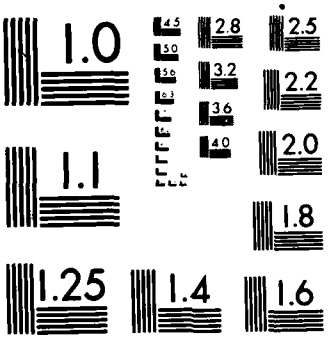
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Program Engineering &
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Washington, D.C. 20591

Cockpit Data Management Requirements (Current Technology Aircraft)

Thomas P. Berry

October 1983

Final Report

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16. Abstract

This study describes a technique for estimating the effect of the data management tasks imposed on flight crews by new systems. It presents the development of a data base of data management tasks in current technology aircraft and examines the effect of four proposed new systems on the data management tasks of a flight crew in these aircraft.

The annexes to the appendix represent data items and times for various emergency situations. Annex A shows the effect of hydraulic and flight control malfunction and Annex B presents the effect of engine failure due to fire. Times and data items for these conditions were developed in a United Airlines DC-10 flight simulator. The pages of the annexes are numbered to indicate which pages of the baseline data base are replaced (e.g., page 94 is replaced with pages 94A through 94U in Annex A) to develop a flight scenario that includes the specific malfunction. Flight crew task-loading profiles showing the action levels caused by the malfunction are included in each annex.

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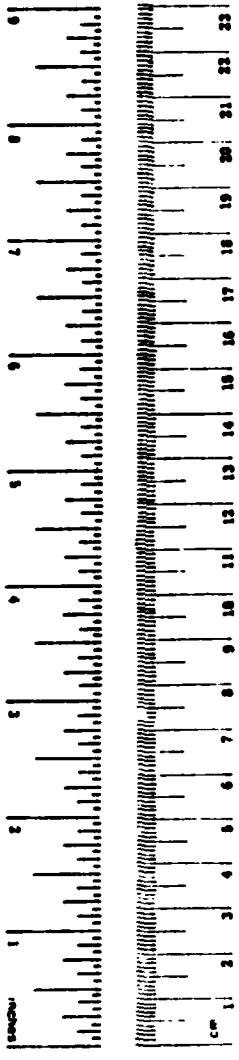
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

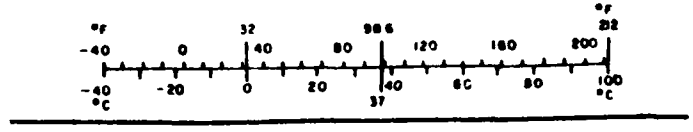
Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures. Price $2.25. SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



60 mph = 52.1 knots (nautical miles per hour)
60 mph = 88'/sec 1g = 32.2'/sec^2

1 mph = .87 knots
1 knot = 1.15 mph



SUMMARY

As navigation, communications, identification, and computational systems have proliferated in modern air carrier aircraft, the tasks associated with management of the data generated by and required by these systems have steadily grown until they occupy a significant proportion of the flight crew's time. Recent technological advances have mitigated the reliability, power, and weight problems of electronic equipment, permitting the design of new and much more complex systems to assist the flight crew and provide more efficient use of the aircraft and airspace.

The evolving character of the National Airspace System (NAS) may redistribute functions between the ground portion and the airborne portion of the system. All these changes will have an effect on current cockpit data management tasks, eliminating or automating some tasks, transferring tasks to different phases of the flight, and creating additional or more time-critical tasks.

Currently, certification of new systems designed for retrofit into existing aircraft is done on a case-by-case basis. While the technical interfaces between the new and old systems are carefully examined, the data management tasks associated with the new system may not be so rigorously examined, especially when the system is being certified under the Technical Standard Order (TSO) process.

This study was initiated in anticipation of the evolution of the NAS and its possible effect on the data management tasks in the cockpit. The study is not intended to develop solutions to the problems associated with the introduction of new systems. It is designed to explore a method of identifying systems and changes that may have an adverse effect on the cockpit data management tasks so that limited development resources can be directed toward those situations that really need investigation. This study develops a procedure that may be used to estimate the effect of data management for a new system on the flight crew of a current-technology aircraft. A scenario flight is used as a baseline, with individual crew member and total crew action levels identified for almost 2,800 actions. The scenario is based on a United Airlines DC-10 flight from Denver to Chicago.

As an exercise to evaluate the operation of the technique, the effect of four new systems is estimated by modifying the baseline scenario to reflect the tasks that would be required with the new system. These systems were chosen to represent four different types of retrofits: (1) the Microwave Landing System (MLS) is designed to replace a current system - the Instrument Landing System (ILS); (2) the Traffic Alert and Collision Avoidance System (TCAS) adds a totally new capability to the aircraft; (3) the Mode-S data link will perform existing functions in a new way; and (4) the 4D Area Navigation System will expand the capabilities of existing systems.

Each system is evaluated to determine which would appear to require additional experimentation to define its effect on the data management tasks in current aircraft. Of these four systems, the MLS, which is now being implemented for straight-in approaches, appears to have little effect. The other three systems will require further experimentation to define their impact on cockpit data management.

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CHAPTER ONE

INTRODUCTION TO COCKPIT DATA MANAGEMENT

1.1 BACKGROUND

In the days of flying goggles, scarves, and open-cockpit airplanes, pilots primarily used the sounds and "feel" of the plane and the positions of the sky, ground, and horizon for control of their craft. Each sound, smell, sight, or tactile sensation provided them with data on the performance of the airplane and the progress of the flight.

Today's pilot, in a pressurized, air-conditioned, shirt-sleeve cockpit environment, must depend on the same five senses for data on the performance of a sophisticated, semiautomated airplane and the progress of the flight through an immensely more complex airspace. The pilot is constantly bombarded by data from many sources while being expected to exchange data among the aircraft and the many other parts of this complex we call the National Airspace System (NAS). As aircraft become more complex and airspace becomes more congested, the pilot must handle ever-increasing volumes of data in all phases of flight.

Aircraft manufacturers, airline operations personnel, and pilots are well aware of this increasing data management task. The Federal Aviation Administration (FAA) is keenly aware of the increased data management role imposed on flight crews by the introduction of new systems and procedures.

Traditionally, each avionics equipment has been certified for installation in aircraft on a stand-alone basis. When equipment was presented for certification in existing aircraft, it was required to meet two major criteria: that it performed its intended purpose and its operation was not hazardous to the aircraft. The integration of the equipment into existing aircraft was largely left to the discretion of the airline or operator, subject to relatively low-level, decentralized FAA concurrence.

Recently, the FAA has come to recognize the increased complexity of avionic and aircraft systems. Consolidation of activities into lead regions and designation of national resources for specified activities has led to a centralized examination of the integration problems that come with additional or technologically advanced systems in existing aircraft and the changing role of the pilot from an operator of relatively simple

systems to a manager of sophisticated systems. In performing their role of system certification in this changing technology, the FAA needs a procedure for assessing the expected changes in the data management tasks resulting from the addition of new systems or replacement of existing systems in current-generation aircraft. This project is one of the early phases of the FAA program to assess cockpit data management in the evolving Air Traffic Control System; it examines an approach to identification of the probable effect of aircraft system changes and an approach to selection of those systems which should receive detailed examination to define the characteristics of their data management tasks.

1.2 OBJECTIVES

The objective of this project is the formulation of a procedure that can be used to make a gross-level assessment of the data management tasks of new systems and identify the requirement for detailed examination of the data management tasks of these systems when integrated with existing aircraft and avionics systems.

1.3 SCOPE

The program phase covered by this report is limited to current-technology aircraft for development of a data base. This study is designed to develop a method that can be used to identify potential problems that should be examined in detail. Other phases of the program will address the method for solving those problems.

1.4 ORGANIZATION OF THE REPORT

This report is organized into five chapters. Chapter One has provided a background of the subject. Chapter Two presents a discussion of the study approach and describes the procedure used to identify systems whose data management tasks require additional definition and characterization. Chapter Three describes the data base developed to support the exercise of the procedure presented in Chapter Two. Chapter Four describes the four systems used in this study to illustrate the operation of the evaluation procedure. Chapter Five presents the conclusions of the study.

The Appendix presents the data collected by observers aboard United Airlines DC-10 flights between Denver, Colorado, and Chicago, Illinois. These data form the baseline for this study.

CHAPTER TWO

STUDY APPROACH

This study is directed toward determining the effect of the adoption of new systems on the tasks required of members of the flight crew of current-technology air transport aircraft. It does not consider economic factors, technological problems, nor industry acceptance of new systems. While these are all valid issues that must be considered in adoption of any new system, this study assumes that any system seriously proposed for operational implementation will have been shown to be technologically sound, economically viable, and acceptable to the aviation industry.

With these assumptions, the study concentrated on data management tasks performed by the flight crew and each member of the crew. To ensure that this study accurately represents the real world of air carrier operations, a subcontract was negotiated with the United Airlines Flight Training Center to identify data management tasks in normal flight scenarios. This subcontract work was performed by personnel of the Training Program Development Division who are routinely engaged in analysis of procedures and development of programs to train pilots in all aspects of air carrier flight operations.

2.1 DEVELOPMENT OF THE DATA BASE

At the outset of the project it was decided that the data base would reflect the data management tasks performed in one specific type of aircraft rather than a composite of tasks performed in a number of aircraft types. Development of a composite data management task inventory would have necessitated subjective compromise and would have resulted in an artificial data base that would be difficult to validate.

United Airlines operates 319 total aircraft of five types: B-727, B-737, B-747, DC-8, and DC-10. The DC-10 was selected from this group. It is a mature aircraft; in general use by a large number of airlines; and is equipped with some of the newer systems, such as inertial navigation, auto-throttle, and advanced flight management systems not available in any other United Airlines aircraft except the B-747. The DC-10 is used on intermediate-length route segments, whereas the B-747 is almost exclusively used on longer-route segments. The United Airlines personnel selected for participation in the study were experienced in DC-10 systems

and procedures. DC-10 simulators were available for investigation and validation of data points, and DC-10 flights from Denver were conveniently scheduled so that cockpit observations could be conducted without requiring overnight trips by the project personnel.

The data management data base (see the Appendix) uses a Denver to Chicago DC-10 flight as the scenario vehicle. United Airlines Flight 280 of 15 July 1982 was selected as the specific scenario flight; and the flight plan, weather briefing, load manifest, flight crew, and event time of this flight are identifiable in the data base. The data base is not wholly built from the activities of this one flight on this specific date. More than 30 flights were flown by observers from both United Airlines and ARINC Research to develop performance times for various data management tasks. These observations were made on United Airlines flights covering at least 12 different center areas. Some flights were made aboard B-727 and DC-8 aircraft to provide a basis for comparing the DC-10 data with other aircraft operating procedures. The collection of data over several flights permitted the insertion of procedures that did not specifically occur on the scenario date. One of these procedures was the setup of the inertial navigation system (INS) for a direct clearance from an en-route position. The scenario flight did include a deviation for weather; but it did not include any emergency procedures.

Emergency procedures and event times were developed in the United Airlines DC-10 simulator. The majority of the event-duration times were developed from observation of flight crew performance during recurrent training and periodic proficiency checks. Once the specific terminal area emergency scenarios were selected, they were flown in the DC-10 simulator to confirm that the times observed during the crew training sessions were reasonable. Each action was numbered sequentially in the order in which they were initiated in the scenario. A total of 2,779 actions were identified. Each action start time, end time, duration, and action level by each crew member is recorded in the data base.

2.2 ESTABLISHMENT OF BASELINE TASK LOADING

During the collection of the performance times that constitute the data base, the activities of each crew member were timed, providing a profile of activities for each minute of the scenario flight. For each activity, each crew member's participation was subjectively classified on a 6-point activity-level scale as shown in Figure 2-1.

The basic level of activity encompasses the basic activity of any crew member -- that of maintaining situational awareness and performing low-level planning for routine future activities. This level of activity may best be illustrated as the en-route situation on a smooth, cloudless day when the aircraft is on auto-pilot and there are no impending course or altitude changes.

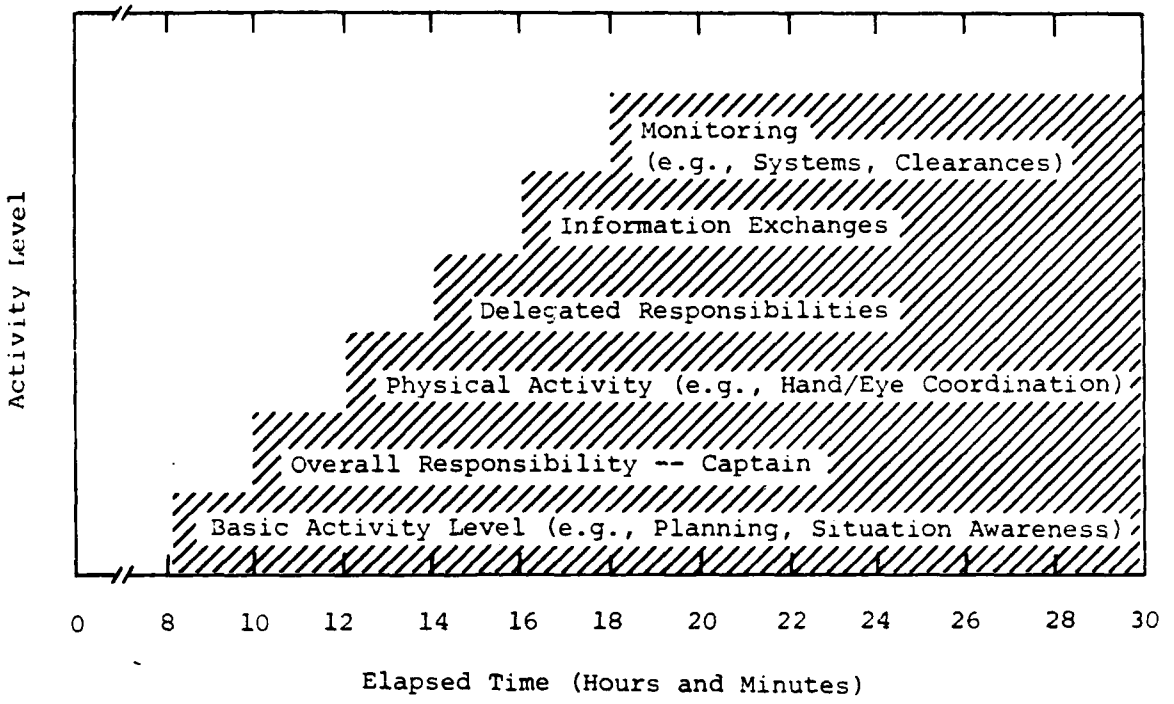


FIGURE 2-1

ACTIVITY-LEVEL MEASURES

The next level shown in Figure 2-1 encompasses the crew coordination responsibilities inherent in the captain's job. In addition to general situational awareness, the captain must be aware of the individual actions of each of the other crew members and plan coordination of upcoming crew tasks. While this activity is designated as the captain's responsibility in Figure 2-1, it actually evolves in large measure on the pilot flying; and when the co-pilot is actually flying the airplane, both pilots may be engaged in this activity. The pilot flying is defined as the pilot actually manipulating the controls and making the takeoff or landing. Normal airline procedure is to rotate the pilot-flying role between the captain and first officer on successive legs of a flight or series of flights on one day.

The third level shown in Figure 2-1 represents the physical activity associated with information-related tasks. This activity includes setting in radio frequencies when directed, adjusting system controls when an instrument indicates an unsatisfactory condition or a change is required, or performing an action as required by a check list.

The fourth level of activity shown in Figure 2-1 requires self-initiated activity that results from company policy, flight manual procedures, or the captain's crew briefing. It includes the initiation of an out, off, on, or in report by the second officer as required by company

policy, the recording of engine readings at the flight midpoint, or the transfer of gate information to the cabin attendants at a specified time before expected arrival.

The fifth level of activity is the exchange of information between the flight crew members and the confirmation of that information. These exchanges may be oral, written, or both. Examples of oral exchanges are the setup and confirmation of INS waypoints between the pilots. The preparation by the second officer and delivery to the pilots of the landing data card is an example of written information exchange. Frequently the delivery of the landing data card will be accompanied by a briefing of the terminal weather given by the second officer.

The sixth level of activity shown in Figure 2-1 is system monitoring. The tasks of system monitoring are divided among the flight crew members with each having a primary area of monitoring responsibility. For example, the second officer has primary responsibility for monitoring fuel, hydraulics, environmental, and electrical systems. The pilot flying has primary responsibility for monitoring aircraft attitude, speed, altitude, and track information. The pilot not flying usually monitors the power systems and air traffic control.

The six activity levels shown in Figure 2-1 are not progressive in nature. While each crew member is usually engaged in the first level of activity, he does not have to be engaged in level 2 or level 3 activity before engaging in level 4 activity. Therefore, each crew member's activity at any given moment is determined by the number of activities he is involved in. A crew member may be active in as many as six levels at one time.

A numerical activity-level total was developed for each new member for each minute of the scenario. This activity level was determined by counting the number of activity levels the crewman was performing each second and then totaling the count within each one-minute interval. This total was divided by 60 to give the average task loading for that minute.

A task-loading profile was developed for each crew-member for each minute of the scenario. Total crew task loading was developed by adding the individual crew task loadings for each minute. Examples of both individual and total crew task loadings are shown in Figure 2-2.

2.3 IDENTIFICATION AND CHARACTERIZATION OF NEW SYSTEMS

Four new systems were used to exercise the data management requirements algorithm -- the Microwave Landing System (MLS), the Traffic Alert and Collision Avoidance System (TCAS), the Mode-S data link, and the Four-Dimensional Area Navigation System (4D RNAV). These systems were chosen because of the maturity of their level of development and the expected phasing of their introduction into the NAS.

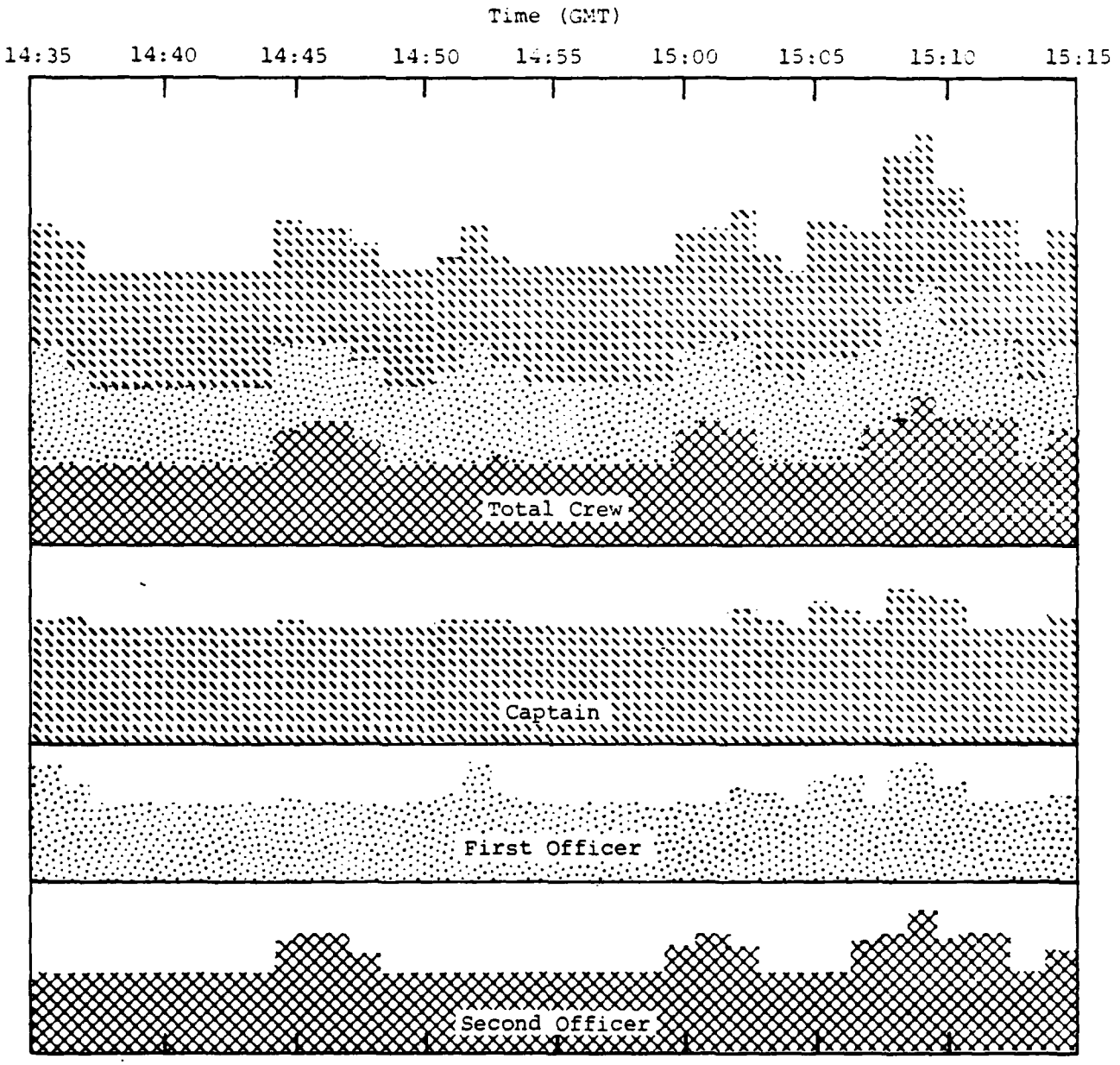


FIGURE 2-2

INDIVIDUAL AND CREW TASK-LOADING PROFILES

The MLS is a mature developmental system and is in the initial deployment phase. It is currently used for only straight-in approaches. Therefore, the data management tasks of the system are relatively well defined. The effect of the system on cockpit tasks is quite similar to the effect of the current ILS; therefore, measurement of ILS tasks and its data management tasks are easily transferable to the MLS.

The TCAS does not have a predecessor system that performs a similar function. TCAS development has reached the point where engineering systems have been flown aboard test aircraft and a generic simulation of the system has been flown in operational airline simulators. Therefore, the best task-loading data available were used to arrive at TCAS task loadings for the scenario.

The Mode-S data link is a new development that has had limited operational assessment. The role of the Mode-S data link and its implementation in the cockpit have not been defined. The Mode-S is a good example of the type of system this study envisions as a subject for evaluation using the data management algorithm. For this study, the role of the Mode-S data link was defined as clearance delivery and acknowledgment, control handoff, and terminal weather and information service. The crew action times for the Mode-S data link were developed from observations of action times required to transmit messages via the ARINC Communications Addressing and Report System (ACARS). ACARS is a privately owned air-ground data link service used for company communications by the air transport industry. The United Airlines DC-10 fleet is equipped with ACARS, and the effects of its use were observed aboard the data collection flights.

The application of 4D RNAV represents a capability growth of current area navigation systems and flight management systems. Most of the functions of 4D RNAV are available from various vendors aboard the Lockheed L-1011-500 and Airbus A-310 aircraft. For this study the tasks required by 4D RNAV were developed from the L-1011-500 flight management system familiarization manual and the A-310 flight management system proposed by Sperry. Times for data entry actions were based on times observed in flight for data entry into the INS.

2.4 IDENTIFICATION OF AREAS SUBJECT TO EXPERIMENTATION

The baseline scenario was modified to delete current actions that would be performed by the new systems and to add the actions that would be required by the new system. New task-loading profiles were developed for the new modified sections of the scenario and compared with the task loading of the baseline scenario. When the new task-loading profile was no higher for any crew member or for total crew task loading, the system was considered acceptable from a crew task-loading standpoint. When any crew member or the total crew experienced a higher task loading with the new system, the system was identified as one for which the effect on flight crew task loading should be examined through further experimentation. This technique does not define the cause of higher task loading nor does

it examine alternative system implementation schemes. The technique does [illegible] evaluation of the usefulness or desirability of the new system. Those are all topics that should be explored in a separate experimental program.

CHAPTER THREE

THE DATA BASE

This chapter describes the organization and features of the data base, which is not currently computerized. However, the data base was prepared with the objective of eventually using a computer to evaluate new systems and different implementations of new systems on flight crew data management tasks. While it was not developed to perform a failure mode and effects analysis, it could be useful in an examination of the effects of system failures on the flight crew task loading.

The data base uses the scenario of a United Airlines DC-10 flight from Denver (DEN) to Chicago (ORD). It follows through on all data generated for the flight crew, by the flight crew, and exchanged among the flight crew members for this flight. It includes initial planning data generated from the company master flight record (flight number, departure city and time, arrival city and time, and equipment). The data base identifies data stored in the United Airlines computer system, including the Automated Flight Plan and Monitoring (AFPAM), Crew Management System (CWS), Automated Weight and Balance (AWB), and Flight Information Controller (FIC) systems. These systems, plus the United Airlines maintenance computer and United Airlines passenger reservation computer system, are tied together in a master system (UNIMATIC) that has access to non-United computer systems such as the Weather Service and NOAA. The UNIMATIC manages the preparation of the flight plan, computation of the aircraft weight and balance, and monitors the progress of the flight through out, off, on, and in (OOOI) reports received from the aircraft via ACARS.

The data base is organized into 22 sections as follows:

- Initial Planning
- Flight Crew Preflight Briefing
- Airplane Condition
- Second Officer Preliminary Cockpit Preparations
- Exterior Inspection
- Second Officer Cockpit Preparation

- Takeoff Data Card Preparation
- Captain's Cabin Crew Briefing
- Captain's Cockpit Preparation
- First Officer's Cockpit Preparation
- Before Start Check List
- Engine Start and Push Back
- After Start and Taxi
- Before Takeoff Check List
- Takeoff
- After Takeoff Check List
- Climb
- Cruise
- Landing Data Preparation
- Approach Descent
- Final Approach and Landing
- Taxi In and Park

The scenario is time-sequenced and lists each data item, its source, and its use. Voice communications among crew members and between the aircraft and the ground are indicated. An example of the scenario detail is shown in Figure 3-1.

The data items or actions indicated in the scenario are numbered sequentially by starting time. The item, its starting time, end time, duration, and the action level of each crew member are defined for each item. Figure 3-2 gives an example of the data item listings with assigned action level for the same time period of the scenario shown in Figure 3-1.

The assignment of an action level for each crew member is made on the basis of observations during several data collection flights and simulation sessions. While assignment of the action level is largely subjective, the observers used the activity levels shown in Figure 2-1 as their measures. The observer personnel were familiar with DC-10 flight operations and with techniques for evaluation of flight crew performance.

Action levels of individual crew members were defined for each minute of the scenario flight. Total crew-action level was determined by adding the action levels of the individual crew members. The resulting action

DATA	SOURCE	USAGE
CRUISE CON'T		
VHF radio 1 tune - 133.77	Minneapolis center - F.O.	Check in
F.O.: "Minneapolis center, United two eighty heavy on 133.77, maintaining 37.0, go ahead."		
MINNEAPOLIS CNTR.: "Roger United two eighty have you on radar, say your speed."		
F.O.: "United two eighty is maintaining 270 knots."		
MINNEAPOLIS CNTR.: "United two eighty, turn left now for spacing to 030°."		
F.O.: "Understand left to 030° for spacing, two eighty."		
CAPT: "Mike, ask if they will approve a speed reduction instead of turning."		
F.O.: "Okay Captain, will do." "Minneapolis center, United two eighty, will you approve a speed reduction instead of heading 030°?"		
14:37:30 MINNEAPOLIS CNTR.: "Roger two eighty reduce to 250 knots and maintain your present track."		
VOR radios, 1 & 2 - tune to 115.8	Enroute map - Capt & F.O.	Confirm distance & bearing to DBQ; check up ISCV
Monitor VOR - DBQ	Aural - Capt & F.O.	Confirm proper call sign for Dubuque.
Weather check for Chicago conditions:	Flight watch - Capt & S.O.	To assess arrival conditions for approach.
VHF radio 2 - check 122.0	FOM - S.O.	Flight watch frequency for weather information.
ACARS - select VOX mode	SOP - S.O.	To permit voice operation.
S.O.: "Flight watch, United two eighty heavy,go ahead."		
FLIGHT WATCH: "United two eighty, this is flight watch, over."		
S.O.: "Flight watch two eighty would like the Chicago 15:30 weather."		
FLIGHT WATCH: "Stand by two eighty."		
FLIGHT WATCH: "United two eighty, flight watch with Chicago weather."		
S.O.: "Flight watch two eighty go ahead."		
FLIGHT WATCH: "Chicago weather for 15:30 - twenty three hundred overcast, eight miles, temperature 76°, wind is one five zero at 15 gusts to 22."		
S.O.: "Thank you, copied all okay, two eighty."		
CAPT: "Thanks, Matt, I got all that."		
ACARS - select data mode	SOP - S.O.	Return to data mode, for normal radio watch.

FIGURE 3-1

EXAMPLE OF SCENARIO SHOWING DETAIL

DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
1926. Enroute chart - consult for Dubuque VOR freq (Capt).	14 37 40	13 45 00	07 20	3	2	2	
1927. VOR radios - tune to 115.8.		05	05	4	3	2	
1928. VOR radios - monitor for proper identification.		10	05	4	3	2	
1929. Chicago weather - requested by Captain.		47 17	02 07	3	2	3	
1930. VHF radio 2 - tuned to 122.0 (S.O.).		27	10	3	2	3	
1931. ACARS VOX mode - select (S.O.).		30	03	3	2	3	
1932. Flight watch - contact (S.O.).		35	05	3	2	3	
1933. Contact acknowledged - Flight watch.		40	05	3	2	3	
1934. Chicago weather for 15:30 - requested.		45	05	3	2	3	
1935. Response - stand by.		50	05	3	2	3	
1936. Radio call - flight watch.		48 10	20	3	2	3	
1937. Radio call - acknowledged (S.O.).		15	05	3	2	3	
1938. 15:30 Chicago weather - 2,300' overcast,		20	05	3	2	3	
1939. - visibility 8 miles,		23	03	3	2	3	
1940. - temperature 76°,		26	03	3	2	3	
1941. - wind 150°/15 knots, gusts to 22 knots.		29	03	3	2	3	
1942. Chicago weather - acknowledged (S.O.).		34	05	3	2	3	
1943. Chicago weather - passed to Captain.		39	05	4	2	3	
1944. ACARS data mode selected - Second Officer.		44	05	3	2	3	
1945. Radio call - Minneapolis center.		51 50	03 06	3	2	2	
1946. Radio call - acknowledged (F.O.).		55	05	3	3	2	
1947. Clearance to chicago center on 133.82 - Minneapolis center.		52 00	05	4	3	2	
1948. Clearance - acknowledged (F.O.).		05	05	3	3	2	
1949. VHF radio 1 - tuned to 133.82.		20	15	3	3	2	
1950. Chicago - contact (F.O.).		25	05	3	3	2	
1951. Cruising - flight level 37.0.		30	05	3	3	2	
1952. Contact - acknowledged (Chicago center).		35	05	3	3	2	
1953. Request Ident - Chicago.		40	05	3	3	2	
1954. Transponder ident button - press.		45	05	3	3	2	
1955. Response to ident & request speed - Chicago.		50	05	3	3	2	
1956. Speed 250 knots - First Officer.		55	05	3	3	2	
1957. Clearance to resume cruise speed & clear of traffic - Chicago		53 00	05	4	3	2	
1958. Clearance & traffic info - acknowledged (F.O.).		05	05	3	3	2	
1959. Speed selector - set to 270.		10	05	4	3	2	
1960. Auto throttles - advance to accelerate to and hold 270knots.		15	05	3	2	3	
1961. FOM (flight ops. manual) - consult for ATIS freq (S.O.).		15 00 15	07 00	3	2	2	
1962. VHF radio 2 - tune to 135.15 (S.O.).		30	15	3	2	3	
1963. VHF radio - monitor to copy terminal information.		32	02	3	2	3	
1964. Information - golf,		34	02	3	2	3	
1965. ceiling - measured 2,300' broken, 8,000' broken,		36	02	3	2	3	

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FIGURE 3-2

EXAMPLE OF DATA ITEM OR ACTION LISTING SHOWING DETAIL

levels were plotted over the scenario time as illustrated in Figures 3-3 and 3-4. The upper portions of Figures 3-3 and 3-4 show the flight altitude and navigation fixes, and the aircraft track information and navigation fixes, respectively.

The examples shown were selected from the cruise segment of the scenario and show a fairly constant level of activity. In this case the captain is the pilot flying and his slightly higher action level reflects the number of data sources monitored while performing that duty. The increased activity of the second officer, which starts at 1445, reflects the action taken in obtaining weather data from flight watch.

This technique permits easy identification of the activity effect of the tasks associated with the operation of any system. For example, the actions identified with ATC communications in Figure 3-2 are items 1945 through 1958. For example, during the evaluation of an ATC data link, those items would be deleted from the crew action list and would be replaced by the actions the crew would perform with the new data link system. A new crew action profile would be developed to reflect the new system, and the differences between the old profile and new profile would provide an indication of the expected effect of the new system. Obviously, the more detailed the data on the design and operation of the new system, the more valid the comparison would be.

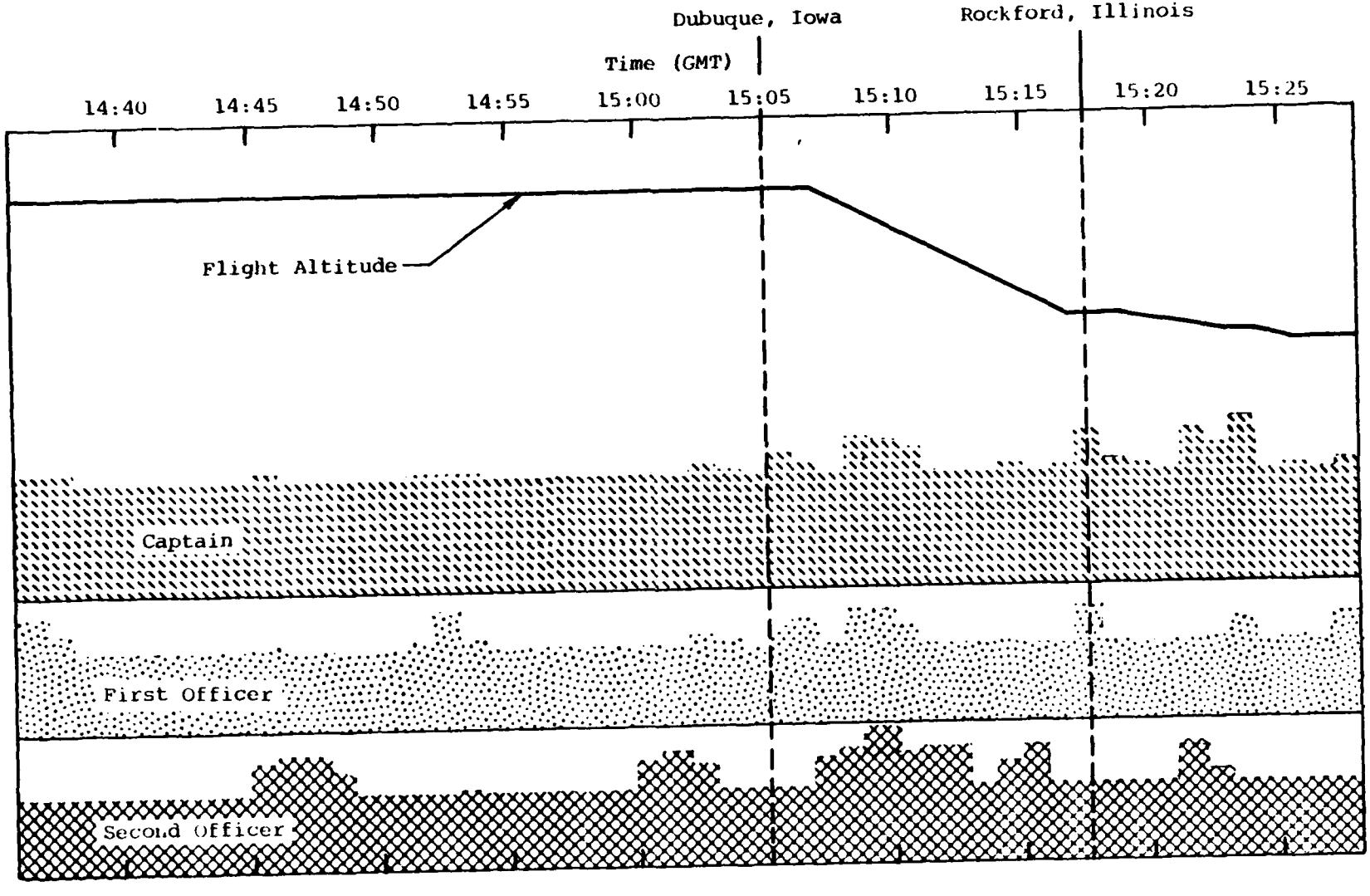
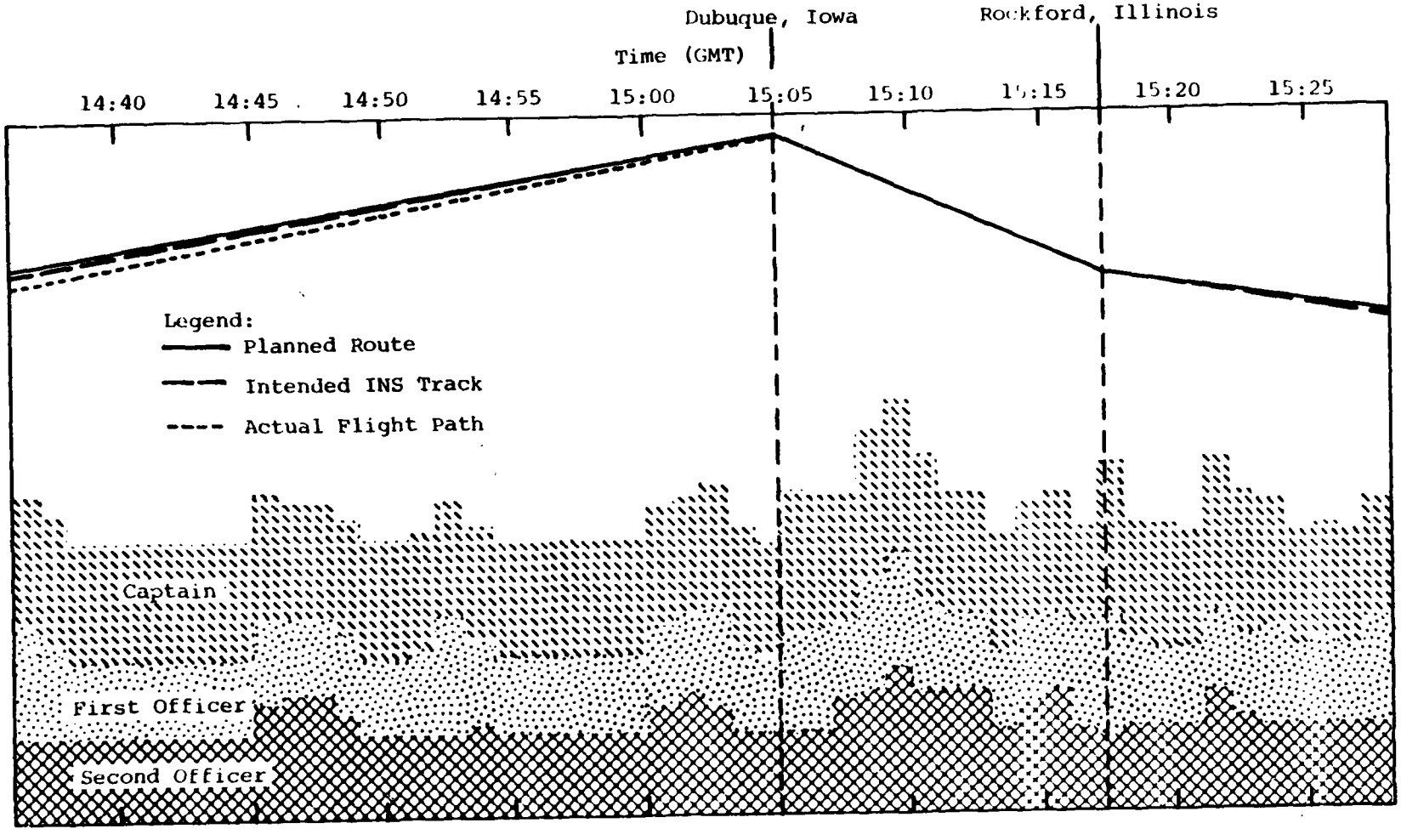


FIGURE 3-3

EXAMPLE OF INDIVIDUAL CREW MEMBER ACTION-LEVEL PLOTS OVER TIME



Note: Constant time; miles not to scale.

FIGURE 3-4

EXAMPLE OF TOTAL CREW ACTION-LEVEL PLOTS OVER THE SAME TIME PERIOD AS SHOWN IN FIGURE 3-3

CHAPTER FOUR

EFFECT OF NEW SYSTEMS ON DATA MANAGEMENT

Four new systems were examined to provide examples of the operation of the data management assessment algorithm:

- Microwave Landing System (MLS)
- Traffic Alert and Collision Avoidance System (TCAS)
- Mode-S Data Link
- Four-Dimensional Area Navigation (4D RNAV)

These systems were chosen because of the expected range of their effect on data management tasks performed by flight crews flying current-technology aircraft and their relative stage of development and maturity.

4.1 MICROWAVE LANDING SYSTEM

The MLS program is well along in its development, with MLS equipment now being flown in limited operations at selected airports.* The MLS role is defined; it is expected to replace the current Instrument Landing System (ILS) as the primary precision approach and landing system within the NAS. Initial stages of the transition from ILS to MLS will include the installation of both systems on the same runway, with virtually identical procedures for both systems. Therefore, MLS cockpit procedures will be almost identical to ILS procedures. In the evaluation of MLS data management tasks, only one additional task is expected by using MLS, i.e., setting of the glide slope angle at the same time the final approach course selector is set. Table 4-1 lists the data item and actions associated with setting up an MLS for approach to Runway 14R at Chicago O'Hare airport. The first three data items, numbered to correspond with ILS items in the data base, are identical to ILS items. Item 2394A indicates the additional action required to enter the glide slope angle into the MLS receiver system. When we assume no change from current navigation

*In April 1983, the FAA requested proposals for procurement of 172 microwave landing systems over a five-year period.

TABLE 4-1

DATA ITEMS AND ACTION LEVELS FOR SELECTING MLS

Data Item or Action	Start Time			End Time			Duration			Action Level			Remarks
	Hours	Min.	Sec.	Hours	Min.	Sec.	Hours	Min.	Sec.	Capt.	F. O.	S. O.	
2392.* MLS Receiver - Tuned to ORD (-----) (Capt.)	15	31	07	15	31	11			04	4	2	2	
2393.* MLS Monitored for Indent (MORD) (Capt.)						15			04	4	2	2	
2394.* Course Selector - Set to 140° (MLS Course)						18			03	4	2	2	
2394a. Glide Slope Selector - Set to 2.5° (MLS Glide Angle)						21			03	4	2	2	

*Replace basic scenario steps.

instrumentation, the MLS flight procedures are identical to current ILS flight procedures and therefore would not require evaluation for their effect on flight crew data management tasks.

When an aircraft is equipped with a 3D or 4D navigation system, the setup of final course and glide slope angle would be done for MLS just as is currently done by such systems for ILS. Because of its close similarity to data management requirements for ILS, the effect of MLS can fairly confidently be estimated as presenting little change from current requirements. The addition of the glide slope selection requirement adds less than one-half unit to the total crew action level for the minute in which it falls. Therefore, implementation of MLS would have a negligible impact on the total flight crew data management task.

4.2 TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS)

The TCAS is a new system and is still being developed. It is not designed as a replacement for any current system. Rather, it will enhance flight safety by automatically detecting dangerous proximity of two aircraft. The system will automatically identify situations threatening potential collisions and develop an escape maneuver that the flight crew must promptly execute to ensure safe passage.

The TCAS development program has progressed to the point where sufficient cockpit simulations and flight tests have been conducted to develop a reasonable set of data items and actions. In addition, sufficient operational data have been collected to provide an understanding of the expected frequency of occurrence of TCAS advisories and an understanding of the phases of flight in which the advisories will likely occur. The operational flight tests also developed average durations for the advisories.*

Since the TCAS does not replace any existing aircraft system, the data items and actions of the flight crew were compiled in a separate file so that data actions and actions could be added to the basic scenario at any point and with any frequency desired. The data items and action levels are listed in Table 4-2. The TCAS activity levels are plotted in Figure 4-1.

Inasmuch as the TCAS advisory can occur at any time in the flight, which most often occurs during the high activity terminal phase of the flight, the TCAS action levels were added to those in the baseline for the approach phase of the scenario. The resulting activity levels are shown in Figure 4-2. It is clear that the TCAS increases the flight crew data management activity above the baseline level. Therefore, the integration of TCAS into the aircraft will require further experimentation to determine the least disruptive method for adding these tasks.

*DOT/FAA/RD-82-90, T. P. Berry and R. D. Brock, In-Service Evaluation of the Dalmo Victor Active Beacon Collision Avoidance System (BCAS/TCAS), October 1982.

TABLE 4-2

DATA ITEMS AND ACTION LEVELS FOR TCAS

	Data Item or Action	Start Time			End Time			Duration			Action Level			Remarks
		Hours	Min.	Sec.	Hours	Min.	Sec.	Hours	Min.	Sec.	Capt.	F. O.	S. O.	
		00	00	00	00	00	03							
1.	Caution Tone Sounds			01			02			03	2	2	2	
2.	Master Caution Light On			02			03			01	2	2	2	
3.	Alert Voice Starts (Traffic)									01	2	2	2	
4.	Radar Indicator Changes to TCAS Mode - Shows Amber Traffic			01			15			15	2	2	2	
5.	Pilot Flying Pushes Out Caution Light, Voice, and Tone			03			04			01	3	2	2	
6.	Look for Traffic			02			12			10	3	3	3	
7.	Warning Tone Sounds			47			50			03	2	2	2	
8.	Master Warning Light On			47			51			01	2	2	2	
9.	Warning Voice Starts (CLIMB ---)			47			51			01	2	2	2	
10.	Radar Indicator Shows Red Traffic			47			55			10	2	2	2	
11.	IVSI Shows Climb Arrow			47			55			10	2	2	2	
12.	Pilot Calls TCAS Climb			48			50			02	3	3	2	
13.	Co-Pilot Confirms TCAS Climb			50			52			02	2	3	2	
14.	Thrust Computer N1 Selector Press			51			54			03	4	3	3	
15.	Throttles - Advance to Climb Thrust Setting			51			56			05	4	3	3	
16.	Co-Pilot Calls ATC			56										
17.	Aircraft Climbs						12			16	4	3	3	
18.	TCAS Light Goes Out			11			12			01	3	3	3	
19.	Altitude Hold Mode - Engage						13			01	3	2	2	
20.	Throttles - Retard to Idle Thrust						18			05	4	3	2	
21.	Pitch Over to Return to Selected Altitude						19			01	3	2	2	
22.	Auto-Pilot Begins Level Off						20			01	3	2	2	
23.	Altitude Hold Mode - Engages						21			01	3	3	3	

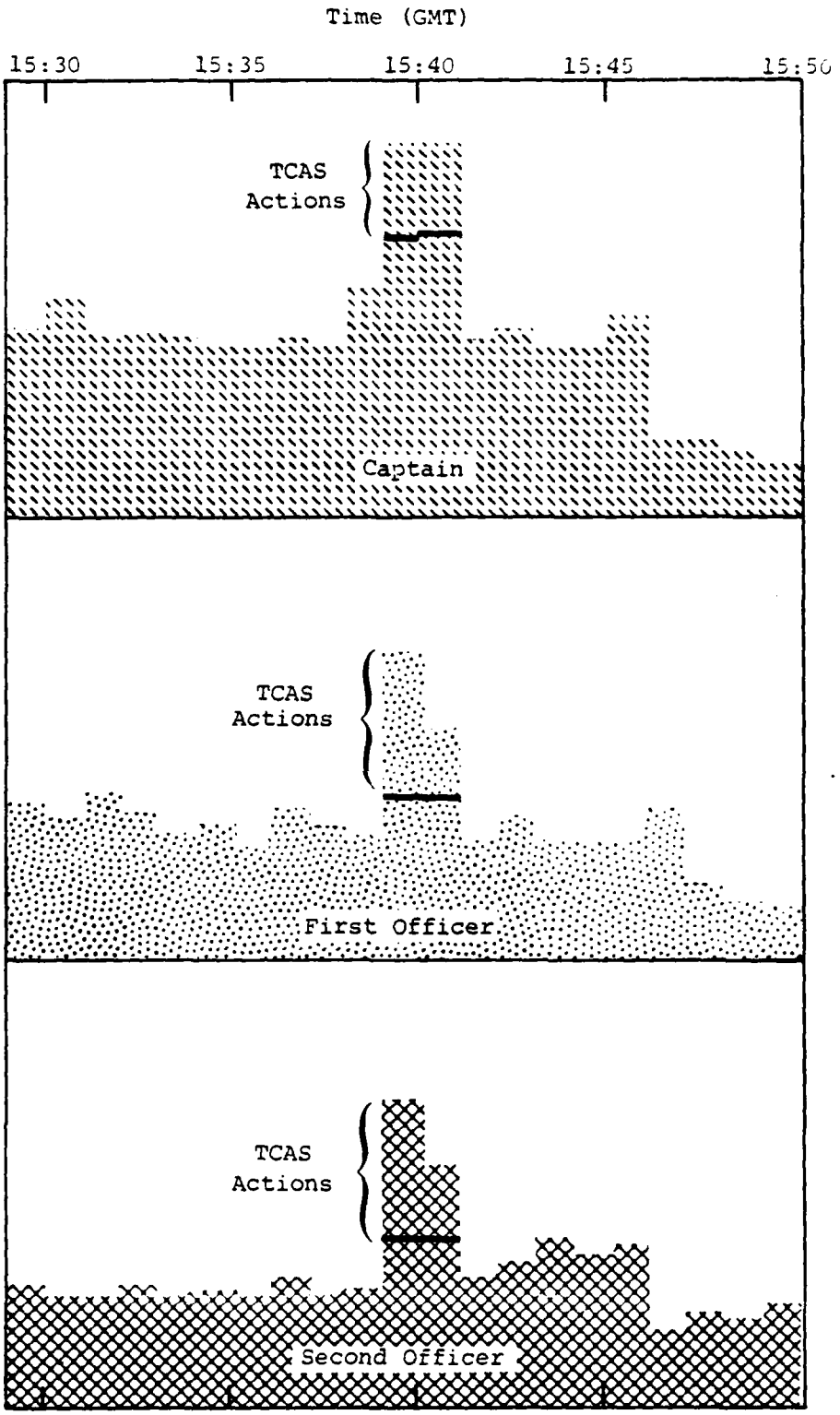


FIGURE 4-1

INDIVIDUAL CREW MEMBER ACTION LEVELS DURING TCAS

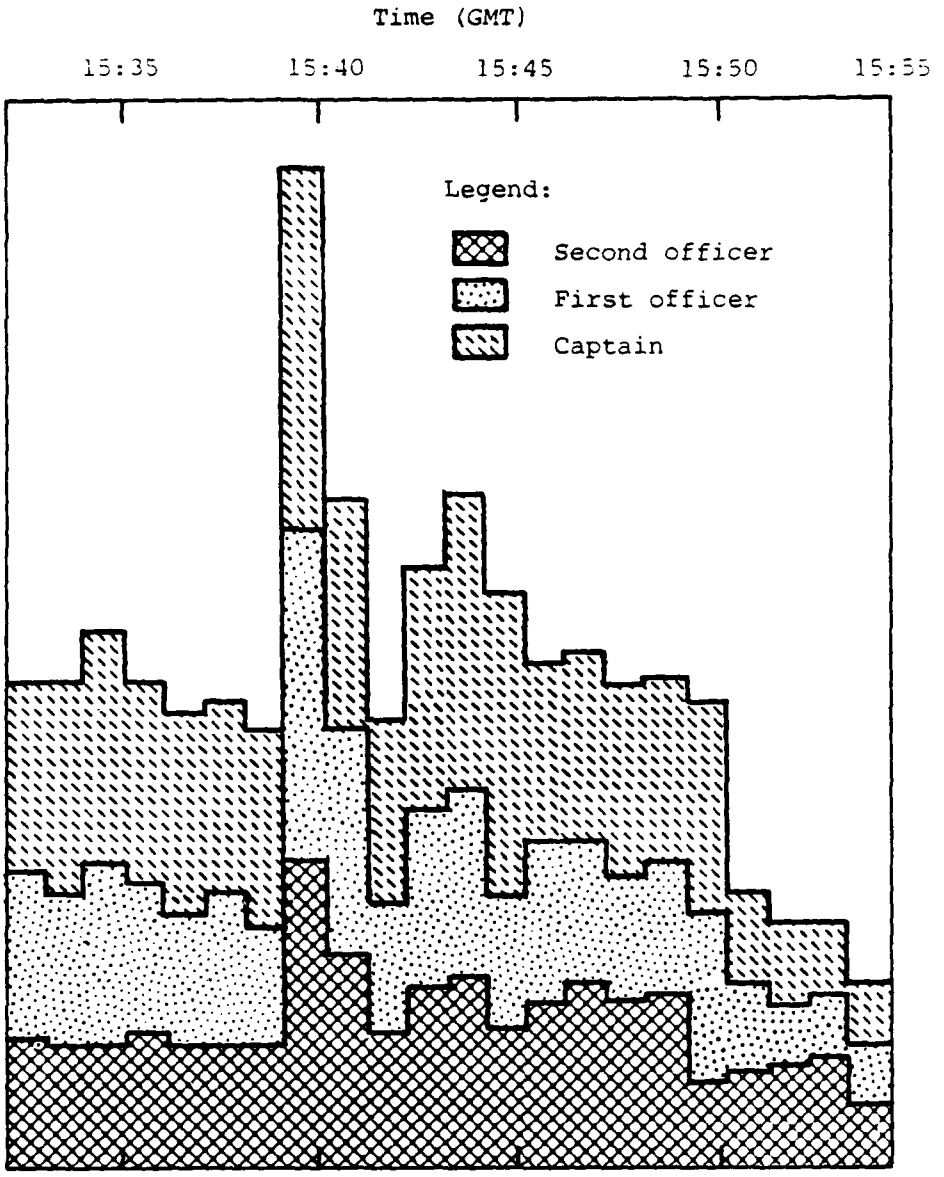


FIGURE 4-2

TOTAL CREW ACTION LEVELS DURING TCAS

4.3 MODE-S DATA LINK

The use of a data link to replace current voice communications with Air Traffic Control is possible with the introduction of the Mode-S secondary surveillance radar system. This system incorporates discretely addressable data link capability not available with the current Air Traffic Control Radar Beacon System (ATCRBS). While the message structures and protocols for the Mode-S data link have been defined, the exact services to be accessible to the Mode-S-equipped aircraft have not. The Mode-S data entry and readout device design has not been defined and may have no single design common to all installations. For purposes of this study, it was assumed that the Mode-S control display unit (CDU) would be similar to a full alphanumeric keyboard CDU such as the one used for a flight management system by Sperry or Smiths Industries. In fact, one possible implementation of Mode-S data link service might share the use of such a CDU for both systems -- data link and flight management. Other installation designs might include a printer for hard copy of selected messages or electronic storage for selected messages such as weather, clearance, or advisories.

This study examined the data items and actions for three data link services:

- Control Handoff
- Clearance Delivery
- Terminal Weather and Information

4.3.1 Control Handoff

En-route control could be handed off by using the steps shown in Table 4-3. Those items are keyed to the control handoff listed in data items 1497 through 1504 in the baseline data (see Appendix). In this case there are two data items deleted and one item added. In addition, the action levels of the three crew members may be different from the action levels recorded in the baseline scenario. The net result in this case is a slight reduction in the total level of data management for this task.

4.3.2 Clearance Delivery

A reliable data link will permit better delivery of clearances from ATC to the aircraft. While current voice communications exhibit high availability, it permits misunderstanding by the flight crew or the controller. Automatically transmitted messages, transmitted over error-detecting and -correcting data links, have many fewer undetected errors. Thus clearance delivery is a natural candidate for the Mode-S data link.

Table 4-4 shows the data items and actions applicable for a data-link-delivered en-route clearance. The data link requires approximately the same number of actions as voice communications, but the data link might require levels of different action from those associated with voice communications.

TABLE 4-3

DATA ITEMS AND ACTION LEVELS FOR DATA LINK EN-ROUTE HANDOFF BY ATC

Data Item or Action		Start Time			End Time			Duration			Action Level			Remarks
		Hours	Min.	Sec.	Hours	Min.	Sec.	Hours	Min.	Sec.	Capt.	F. O.	S. O.	
1497.	Data Link Alert Tone	13	53	46	13	53	48			02	3	3	2	
1499.	Data Link Display "DEN CTR 135.5"						50			02	3	3	2	
1500.	Press Acknowledge						52			02	3	3	2	
1501.	Select 135.5 on #1 VHF COM						55			03	3	3	2	
1502.	Press ID						57			02	3	3	2	
1505.	Climb/Maintain FL370						59			02	3	3	2	
1506.	Press Acknowledge				13	54	01			02	3	3	2	

TABLE 4-4

DATA ITEMS AND ACTION LEVELS FOR DATA-LINK-DELIVERED EN-ROUTE CLEARANCE

Data Item or Action		Start Time			End Time			Duration			Action Level			Remarks
		Hours	Min.	Sec.	Hours	Min.	Sec.	Hours	Min.	Sec.	Capt.	F. O.	S. O.	
1802.	Data Link Display Alert Tone	14	20	00	14	20	02			02	3	3	2	
1804.	Data Link Display "Are You Equipped With 1-INS, 2-OMEGA?"						04			02	3	3	2	
1805.	Enter 1						06			02	3	3	2	
1805a.	Enter "Send"						07			01	3	3	2	
1805b.	Data Link Display Alert Tone	14	20	10	14	20	12			02	3	3	2	
1806.	Data Link Display "UA 280 Cleared Present Position Direct DBQ, Acknowledge"						14			02	3	3	2	
1807.	Press Acknowledge						16			02	3	3	2	
1807a.	Data Link Alert Tone	14	20	58	14	21	00			02	3	3	2	
1808.	Data Link Display "MPS CTR 135.1 Now"						02			02	3	3	2	
1809.	Press Acknowledge						04			02	3	3	2	
1831.	Select 135.1 on VHF Com						07			03	3	3	2	
1832.	Press ID						09			02	3	3	2	
1803.	Acknowledge Light Lights and Flashes						10			01	3	3	2	
1804.	Press Out Acknowledge Light						12			02	3	3	2	

4.3.3 Terminal Weather and Information

Delivery of weather and related information is another good candidate for data link service. This type of service is different from clearance delivery and control handoffs inasmuch as the communications change is initiated by the flight crew. In the example shown in Table 4-5, the responsible crew member, the second officer in this case, must initiate a message in much the same manner as currently initiated for a voice communication. Because the Mode-S data link operates on a fixed frequency, it will not be necessary for the second officer to look up and tune the Automatic Terminal Information Service (ATIS) frequency. He must, however, select the type of message he would like to send from among the limited number of preformatted message types. This is done by selecting from a message menu. In addition to selecting the type of message, the second officer must enter the identification of the location for which information is required.

When the ATIS information is received, it must be recorded in some manner. Currently, pilots may write the ATIS information on scrap paper, directly on a landing data card, or on a flight progress form of some kind. The ATIS information is continuously repeated, permitting the pilot to copy it and review that copy on a subsequent repetition of the ATIS.

With a data link system the pilot could write the displayed message on paper, store the message in electronic memory, or print the message, if the system is equipped with a printer. For this study it was assumed that the system was equipped with a printer. The addition of a printer to a data link-equipped aircraft is consistent with current installation of the ARINC Communications and Reporting System (ACARS). ACARS is a VHF data link used for company communications by several airlines. While the system does not require a printer, many users of the system have chosen to include a printer in their ACARS installation so that the crew can retain a hard copy of any message. ACARS printers are currently being used to deliver weather information, connection gate information, weight and balance data, and other similar messages.

The use of a data link for an aircraft-initiated message, as shown in Table 4-5, may require more action to initiate than is now required by a voice contact; however, the use of a printer requires less concentration than copying the automatic ATIS message and should result in fewer undetected errors.

One possible implementation of ATIS information delivery via Mode-S data link that was not included in this scenario is the automatic delivery of ATIS to aircraft when the ATIS content changes after it is requested. Thus, when an aircraft requests ATIS information for a specific location, the Mode-S system would enter that aircraft's address into a file of aircraft that need ATIS information for that location. As long as the aircraft continues to be tracked by the Mode-S system, it would remain in that file. Whenever the ATIS information changed, it could be automatically delivered to all aircraft listed in that file. Thus, a flight

TABLE 4-5

DATA ITEMS AND ACTION LEVELS FOR DATA-LINK-DELIVERED ATIS MESSAGE

Data Item or Action	Start Time			End Time			Duration			Action Level			Remarks
	Hours	Min.	Sec.	Hours	Min.	Sec.	Hours	Min.	Sec.	Capt.	F. O.	S. O.	
Push "O/L Menu"	15	00	15	15	00	17			02	3	3	2	
1961a. Push "ATIS" Button						19			02	3	3	2	
1961b. D/L Display "ATIS???"						20			01	3	3	2	
1961c. Enter "O"						22			02	3	3	2	
1961d. D/L Display "ATIS O??"						23			01	3	3	2	
1961e. Enter "R"						24			02	3	3	2	
1961f. D/L Display "ATIS OR?"						25			01	3	3	2	
1961g. Enter "D"						27			02	3	3	2	
1961h. D/L Display "ATIS ORD"						28			01	3	3	2	
1961i. Push "Send"						30			02	3	3	2	
1962. Data Link Alert Tone	15	00	10	15	00	42			02	3	3	2	
1963. Data Link Display "ORD ATIS" Flashes						43			01	3	3	2	
1964. D/L Display "ORD-G M23$80$8 76/66 150/15+22 29.54 ARR 14R DEP 14L"						45			02	3	3	2	
1969a. Push "Print"						50			05	3	3	2	
1969b. Printer Prints Message						53			03	3	3	2	

crew would always have the latest ATIS information and could also keep current weather information at their alternate airport in the same manner. Other automatic delivery schemes are also available.

4.3.4 Four-Dimensional Area Navigation (4D RNAV)

4D RNAV systems provide navigation guidance to position the aircraft over a specific point, at a specific altitude, at a specific speed, at a specific time. Current flight management systems permit navigation to specific points, at a specific altitude, and at a specific speed. Current systems do not adjust the flight path so that the aircraft will arrive at the point at a specific time.* Most current flight management systems will compute speeds and vertical profiles to meet such objectives as economy cruise, long-range cruise, best rate of climb, best angle of climb, or economy climb. Such profiles are automatically computed by the flight management system on the basis of weight, temperature, winds, and altitudes.

The data management requirements for a 4D RNAV or flight management system (FMS) are significant. Many of the data requirements for the system are met by permanent storage of fixed data such as performance curves, fuel consumption curves, speed/configuration limits, and control algorithms. Other data, such as airway routes, approach procedures, and waypoint descriptions, change on a cyclic basis. These data are usually automatically loaded from some type of transportable data storage medium such as a tape cassette or data diskette. Normally, the flight crew is not engaged in loading of the data, but they are responsible for checking to determine that the current data package is loaded.

Some data must be entered at the time of the calculation, including designation of the flight route and altitude, fuel data, weight and balance data, flight plan times, and selection of performance options.

A set of data management tasks associated with en-route use of a 4D RNAV or FMS is shown in Table 4-6. These tasks are based on those used in currently available FMS equipment and illustrate the entry of a direct route using INS as the navigation system. These tasks compare with the baseline scenario tasks associated with an en-route use of an INS system for a direct clearance as shown in task items 1810 through 1858. A task-loading profile is shown in Figure 4-3. The use of a 4D RNAV or FMS for this type of situation adds little to the flight crew data management tasks. The data management tasks associated with 4D RNAV can be significant, but their effect on the flight crew is largely a matter of the techniques used in implementation of the system. Therefore, each application of these systems should be examined for their effect on data management.

*In April 1983 the FAA granted certification to Lockheed for a 4D flight management system that adds the time dimension to normal navigational, vertical profile, and speed control functions.

TABLE 4-6

DATA ITEMS AND ACTION LEVELS FOR 4D RNAV

Data Item or Action	Start Time			End Time			Duration			Action Level			Remarks
	Hours	Min.	Sec.	Hours	Min.	Sec.	Hours	Min.	Sec.	Capt.	F. O.	S. O.	
									01	4	3	2	
1810a. Select NAV on CDU	14	20	32	14	20	33							
1810b. Select NAV Mode Page						34			01	4	3	2	
1810c. Select INS 1 VAL/IN						35			01	4	3	2	
1810d. Select INS 2 VAL/IN						36			01	4	3	2	
1810e. Select INS 3 VAL/IN						37			01	4	3	2	
1810f. Check VHF 1 VAL/IN						38			01	4	3	2	
1810g. Check VHF 2 VAL/IN						39			01	4	3	2	
1810. Check Inside N/A						40			01	4	3	2	
1818. Check NAV Mode IDD or IDV						41			01	4	3	2	
1819. Select NAV on CDU						43			02	4	3	2	
1820. Select Change Route						45			02	4	3	2	
1821. Select Go Direct						47			02	4	3	2	
1822. Review Waypoint List				14	21	02			15	4	3	2	
1823. Select AC POS						04			02	4	3	2	
1824. Select Direct to Waypoint						06			02	4	3	2	
1825. Select Execute						08			02	4	3	2	
1826. Select NAV on CDU						10			02	4	3	2	
1827. Select Flight Stat Page						12			02	4	3	2	
1828. Confirm Flight Status						22			02	4	3	2	
Select Waypoint Time									10	4	3	2	
Insert Waypoint Time													
Select Waypoint Speed													
Insert Waypoint Speed													

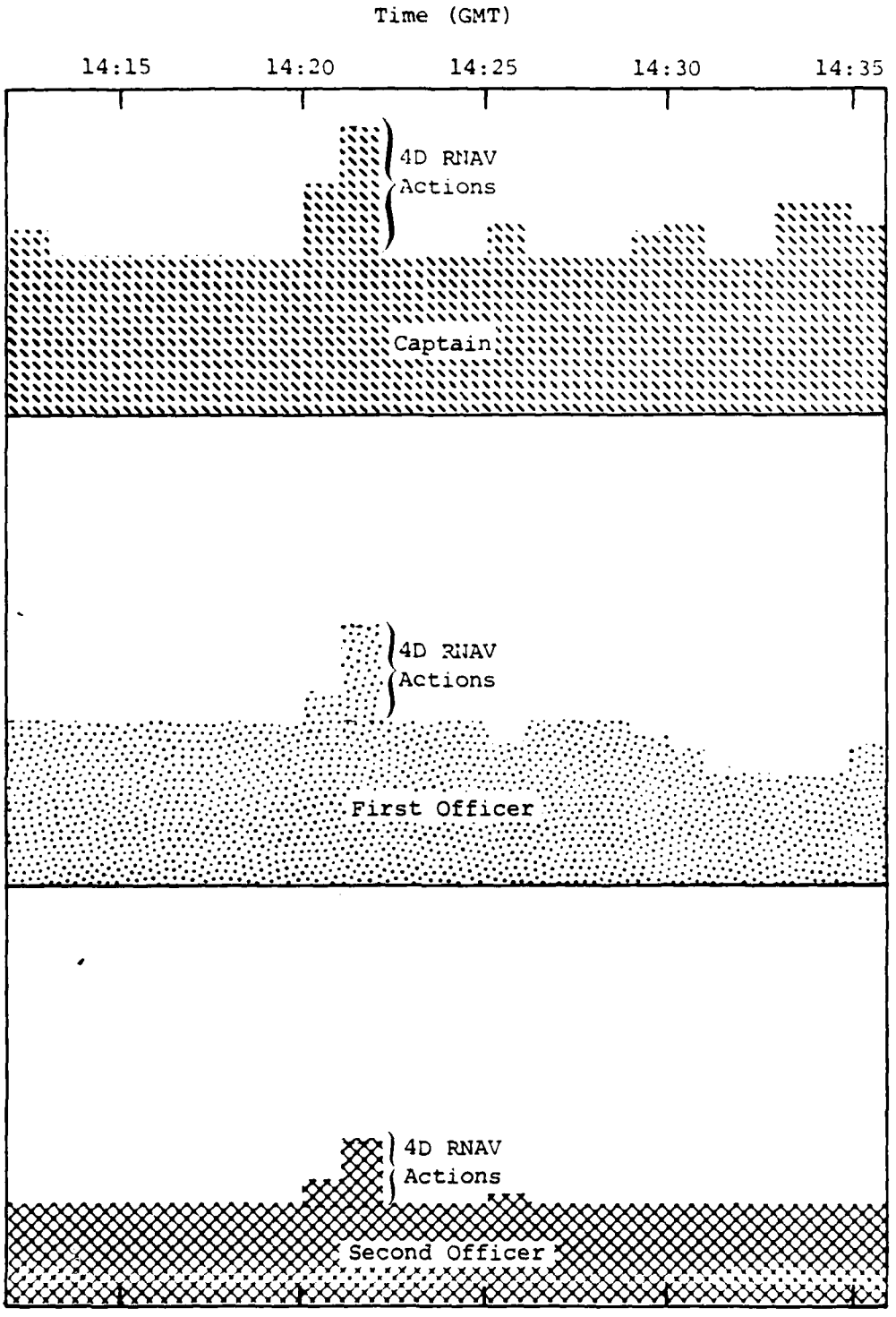


FIGURE 4-3

INDIVIDUAL CREW LOADING FOR 4D RNAV

CHAPTER FIVE

CONCLUSIONS

A profile, based on crew action levels, appears to be quite useful in estimating the effect of future systems on the data management tasks of the flight crew. This study concentrated on the development of the baseline data and scenario and examined four new systems to demonstrate the operation of the technique. The data base was not computerized, but it was constructed to permit computerization. The new systems were evaluated manually.

Four new systems were used to exercise the data management requirements algorithm -- the Microwave Landing System (MLS), the Traffic Alert and Collision Avoidance System (TCAS), the Mode-S data link, and the Four-Dimensional Area Navigation System (4D RNAV). These systems were chosen because of the maturity of their level of development and the expected phasing of their introduction into the NAS.

5.1 SYSTEMS EXAMINED

Four types of new systems were evaluated:

- A system that replaces a current system and provides largely technological improvements with few changes in operation. The Microwave Landing System was chosen to illustrate this type of system, because it is operationally similar to the instrument landing system it will replace.

- A system that provides a service that was not currently available to the flight crew. The Traffic Alert and Collision Avoidance System was chosen to illustrate this type of system.

- A system that is functionally similar to current systems but is planned for a new application. The Mode-S data link was chosen to illustrate this type of system, because it is functionally similar to the ARINC Communications and Reporting System (ACARS) currently used by some airlines for company communications. The new applications of this data link can include automated delivery of weather information, clearances, and control handoffs.

- A system that extends capabilities found in current systems. The Four-Dimensional Area Navigation System was chosen to illustrate this type of system, because it extends the capabilities of current area navigation and flight management systems to permit precise four-dimensional positioning of aircraft by the flight crew.

5.2 CONSIDERATIONS

During the evaluation of the new systems it became apparent that as the data management tasks of the new systems are better defined, the tasks on flight crew action levels can be better estimated. The MLS is ready for operational implementation; therefore, its tasks are relatively well defined. The TCAS has been subjected to extensive flight and flight simulation operational testing, and the data management tasks are largely apparent.

The other two systems, Mode-S data link and 4D RNAV, illustrate systems whose operational implementation is not yet well defined. In fact, the current RNAV and flight management systems show some significantly wide variations in data management tasks. Those variations are related to the number of services provided by the systems and the degree of integration of the system with other systems aboard the aircraft. Therefore, these two systems appear to represent types of systems that do not lend themselves to assessment of data management tasks by category. Instead, these systems illustrate the type of systems for which each application of the system (by aircraft, system manufacturer, and airline operator) should be separately evaluated.

5.3 LESSONS LEARNED

The development of the data base and scenario and evaluation of data base management tasks associated with four new systems provided enough experience to establish some basic guidelines, as addressed in the following paragraphs.

The baseline data base should be restricted to normal operating procedures. Thus data management tasks arising from aircraft emergencies, changes in flight procedures, introduction of new systems, and removal of existing systems can all be evaluated with the same algorithm and can be directly compared.

As data management tasks of new systems are better defined, the easier the evaluation of their effect on the flight crew can be evaluated. We found that the MLS was much easier to evaluate than the Mode-S data link. Once a system is evaluated with this technique, it should be reevaluated when its design changes or new capabilities or functions are added to it.

The personnel who prepare the data management items or actions for new systems should be experienced in current flight procedures and the functions, capabilities, and proposed implementation concept of the new system. Pictures, diagrams, mockups, and actual copies of the data entry and display hardware assist in analyzing the tasks associated with entering and using the data required by or delivered by the system. Personnel who develop these items or actions must know what data are required by the system, where the crew obtains the data, what data are produced by the system, and what the data are used for. The process of developing the action levels is subjective, and the results of the algorithm are sensitive to the quality of the understanding of these factors by the personnel conducting the study.

5.4 RESULTS

The concept of laying data management tasks associated with new systems over a baseline of data management tasks now performed in current aircraft is a useful method for making a first-level judgment of the effect of new systems on the flight crew. The concept accommodates all types of new systems -- those which replace current systems, those which add new capabilities to existing systems, those which extend the functions of current systems to new applications, and those which provide new capabilities to the aircraft or crew.

An analysis of the expected effect of new systems on flight crew data management tasks requires personnel familiar with both flight operations and the requirements and functions of the new system. This concept does not define acceptability or usefulness of a new system to the flight crew nor the effect of the system on the other sections of the NAS. It does provide an easily employed technique for selecting systems for further experimentation in which usefulness or safety may be traded off against their effects on crew data management. It also provides a technique by which combinations of new systems may be evaluated to determine if the combination has less of an impact than either of the systems alone.

APPENDIX

BASELINE DATA FOR COCKPIT DATA MANAGEMENT TASKS

This appendix reproduces information prepared by United Airlines and presents the baseline data for cockpit data management tasks collected from in-flight task and time observations made on United Airlines Flight 280 between Denver, Colorado, and Chicago, Illinois. Data on flight planning, weather, weight and load, and crew names represent those used on the flight of 15 July 1982. All task and action data and elapsed times represent an averaging of these items over a three-month period of in-flight observation.

The annexes to this appendix represent data items and times for various emergency situations. Annex A shows the effect of hydraulic and flight control malfunction and Annex B presents the effect of engine failure due to fire. Times and data items for these conditions were developed in a United Airlines DC-10 flight simulator. The pages of the annexes are numbered to indicate which pages of the baseline data base are replaced (e.g., page 94 is replaced with pages 94A through 94U in Annex A) to develop a flight scenario that includes the specific malfunction. Flight crew task-loading profiles showing the action levels caused by the malfunction are included in each annex.

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ABBREVIATIONS

AC	-	Alternating current
A/C	-	Airplane or air conditioning
ACK	-	Acknowledge
ADF	-	Automatic direction finder
ADV	-	Advise
AFPAM	-	Automated flight planning and monitoring
A/I	-	Anti ice
AIM	-	Radar control (approach, departure & weather)
AIRMET	-	Airmen's meteorological information system
ALT	-	Altitude
ALTN	-	Alternate
AMIS	-	Airdraft maintenance information system
ANN	-	Annunciator
A/P	-	Auto pilot
APP	-	Approach
APU	-	Auxiliary power unit
AR	-	aircraft routing
ARINC	-	Aeronautical Radio Incorporated
ARR	-	Arrival
ARTC	-	Air route traffic control
A/S	-	Air speed
ASR	-	Airport surveillance radar
ATC	-	Air traffic control
ATIS	-	Automated terminal information system
ATOG	-	Actual take off gross weight
ATS	-	Auto throttle system
AWB	-	Automated weight and balance system
BRF	-	Briefing
BAL	-	Balance
BARO	-	Barometer
BAT	-	Battery
BKS	-	Brakes
CAB	-	Cabin
CAPT	-	Captain
CAT	-	Clear air turbulence
CDL	-	Configuration deviation list
CL	-	Climb
CLR	-	Clear
CMS	-	Crew management system
COM	-	Communication
COMP	-	Company
CONF	-	Confirm
CONT	-	Control
CON'T	-	Continued
CR	-	Cruise
CSD	-	Constant speed drive
DEL	-	Delivered
DEPT	-	Departed
DESC	-	Descent
DEST	-	Destination
DEV	-	Deviation
DH	-	Decision height
DIR	-	Direct
DISC	-	Disconnect
DISP	-	Dispatch
DME	-	Distance measuring equipment
DN	-	Down
DRM	-	Dispatch release message
EAT	-	Expected approach time
ENG	-	Engine
EST	-	Estimate
ETA	-	Estimated time of arrival
ETD	-	Estimated time of departure
ETE	-	Estimated time enroute
EXT	-	Exterior
FAF	-	Final approach fix
FAR	-	Federal aviation regulations
FAS	-	Freight accounting system
FCST	-	Forecast
FD	-	Flight director
FF	-	Fuel flow
FFA	-	First flight attendant
FGS	-	Flight guidance system

FL - Flight level
FLD - Field
FLIFO - Flight information
FLT - Flight
FM - Fuel management
F.O. - First Officer
FPF - Flight plan forecast
FPM - Feet per minute
FREQ - Frequency
FSS - Flight service station
FT - Feet
FWD - Forward

GAL - Gallon
GCA - Ground controlled approach
GPWS - Ground proximity warning system
GMT - Greenwich mean time
GND - Ground
GR/WT - Gross weight
GS - Glide slope

HDG - Heading
HF - High frequency
HG - Inches of mercury
HGT - Height
HI - High
HR - Hour
HSI - Horizontal situation indicator
HYD - Hydraulic

IAF - Initial approach fix
IAS - Indicated air speed
IDENT - Identification
IFR - Instrument flight rules
IGN - Ignition
ILS - Instrument landing system
IND - Indicator
INFO - Information
INIT - Initial
INOP - Inoperative
INS - Inertial navigation system
INST - Instrument

KHZ - Kilohertz
KT - Knot

LAT - Latitude
LF - Low frequency
LND - Land
LNDG - Landing
LO - Low
LOC - Localizer
LOM - Locater outer marker
LONG - Longitude
LT - Light or left

M - Mach
MAN - Maneuvering
MAP - Missed approach point
MAX - Maximum
MCA - Minimum crossing altitude
MDA - Minimum descent altitude
MEA - Minimum enroute altitude
MEL - Minimum equipment list
MET - Meteorological
MIC - Microphone
MIN - Minimum
MKR - Marker
MM - Middle marker
M-P - Motor-pump
MPH - Miles per hour
MSA - Minimum safe altitude
MSG - Message
MSL - Mean sea level
MTCA - Minimum terrain clearance altitude
MX - Maintenance

NA - Not authorized
NAV - Navigation
NM - Nautical mile

NORM - Normal
NOTAM - Notices to airmen
N_1TAT - N_1 thrust computer

OPBOP - Systems operations control department (UA)
OPN - Operation
OXY - Oxygen

PA - Passenger address
PAX - Passengers
PF - Pilot Flying
PNEU - Pneumatic
PNF - Pilot not flying
POD - Point of descent
POSBD - Operationally important message
POSN - Position
PRECIP - Precipitation
PRELIM - Preliminary
PREP - Preparation
PRESS - Pressure
PT - Point

Q - Quantity
QNE - Altimeter setting

RA - Radio altimeter
RCA - Reach climb altitude
REL - Release
REV - Reverse
RTE - Route
RVR - Runway visual range
RWY - Runway

SAT - Static air temperature
SEC - Second
SEL - Select or selector
SFC - Surface
SID - Standard instrument departure
SIGMET - Significant meteorological condition

S.O. - Second Officer
SOP - Standard operating procedure
SPD - Speed
STAR - Standard terminal arrival route
STD - Standard
STDB - Stand by
SW - Switch
SYS - System

TAS - True air speed
TEMP - Temperature
TRK - Track
TWR - Tower

UA - United Airlines
UNIMAT - Unimatic

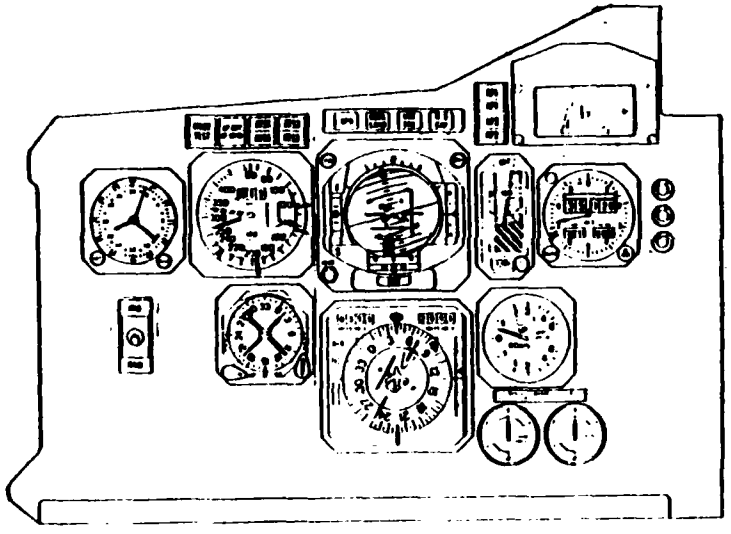
VFR - Visual flight rules
VHF - Very high frequency
VOR - Omni directional range
VOT - Test signal VOR
VOX - Voice

WN - Warning
WT - Weight
WX - Weather
WYPTS - Waypoints

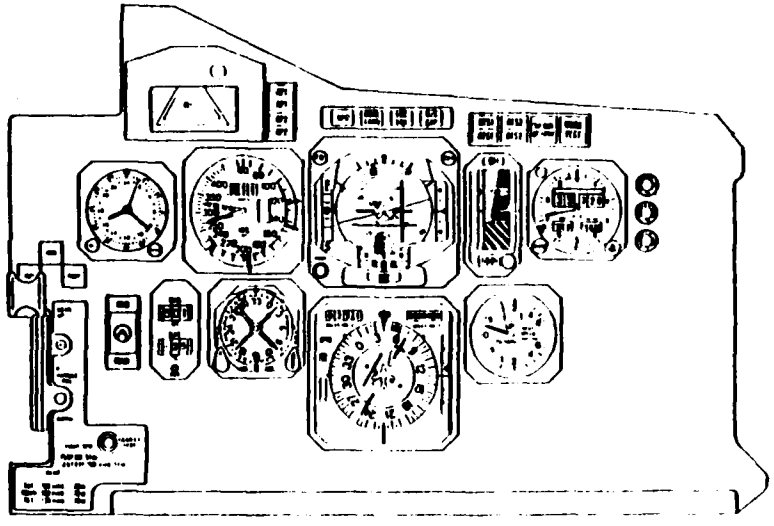
XFEED - Cross feed
XMIT - Transmit
XTIE - Cross tie

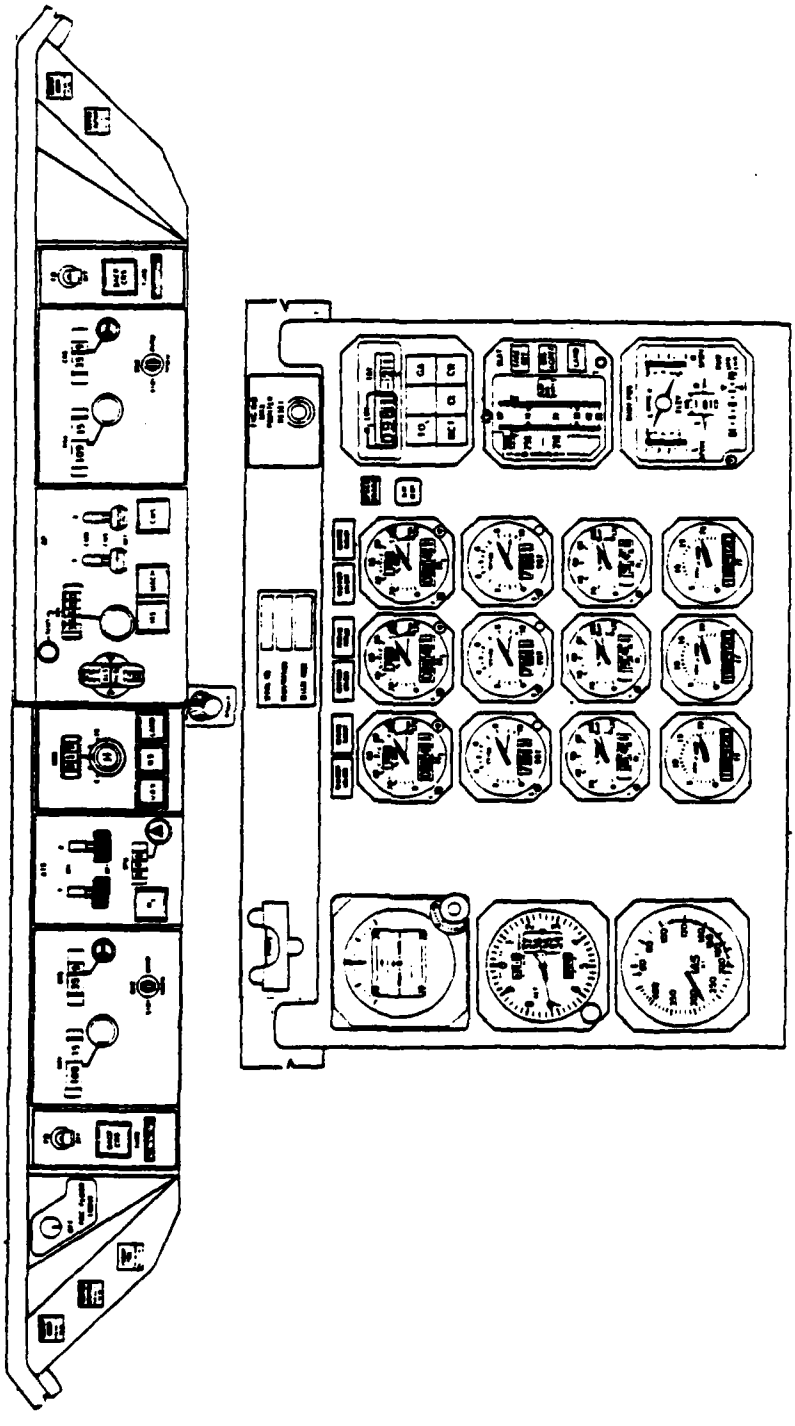
Z - ZULU (Greenwich mean time)
ZFW - Zero fuel weight
ZMKR - Z marker

CAPTAIN'S INSTRUMENT PANEL

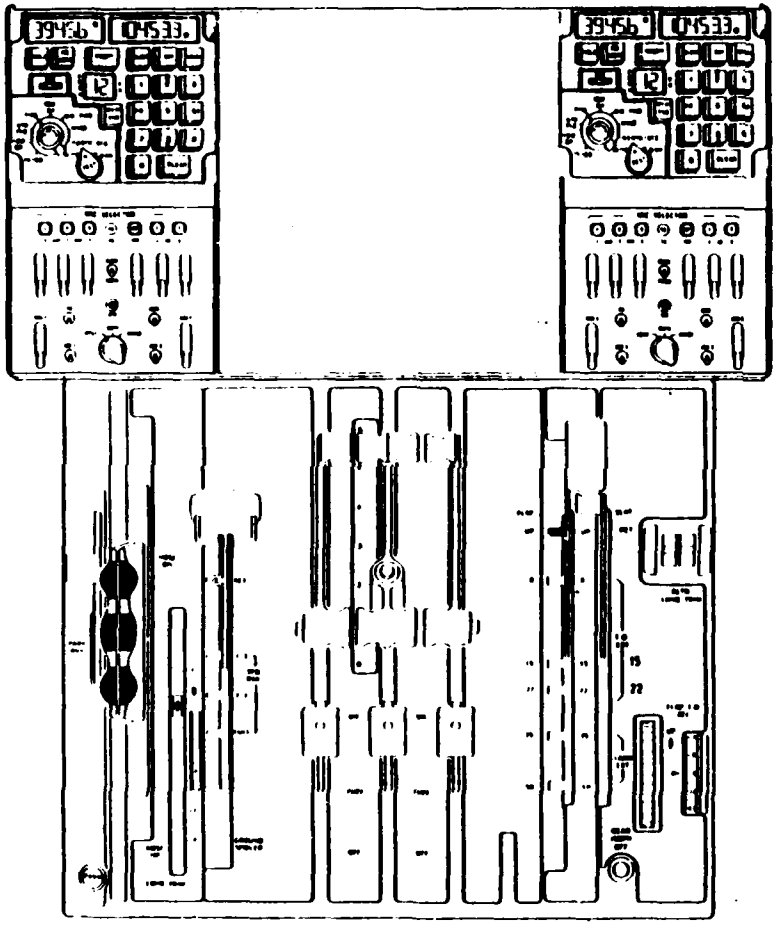


FIRST OFFICER'S INSTRUMENT PANEL

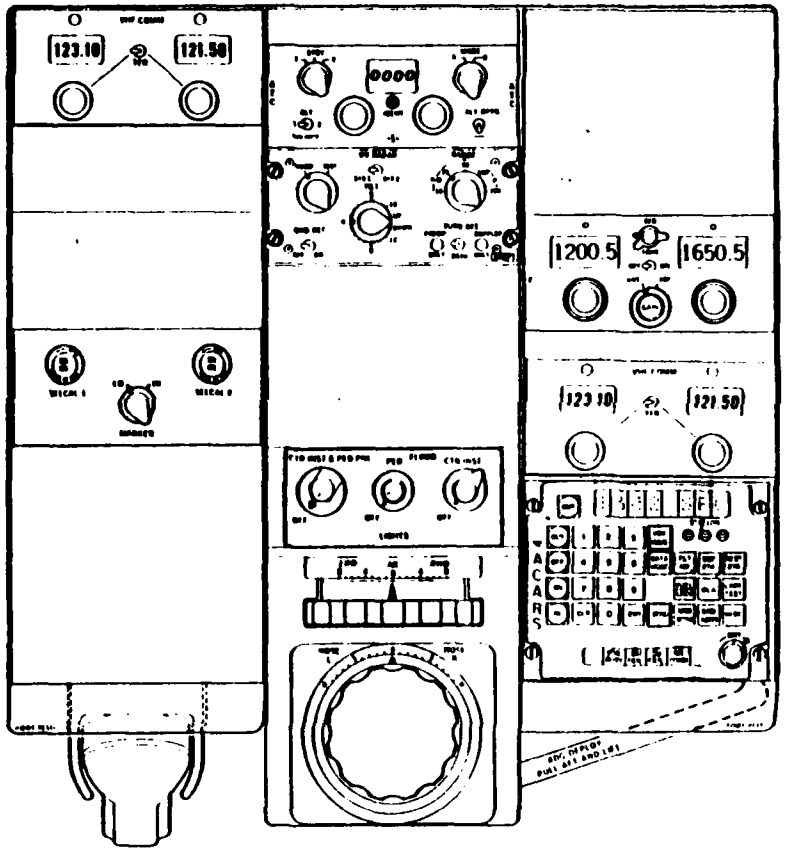




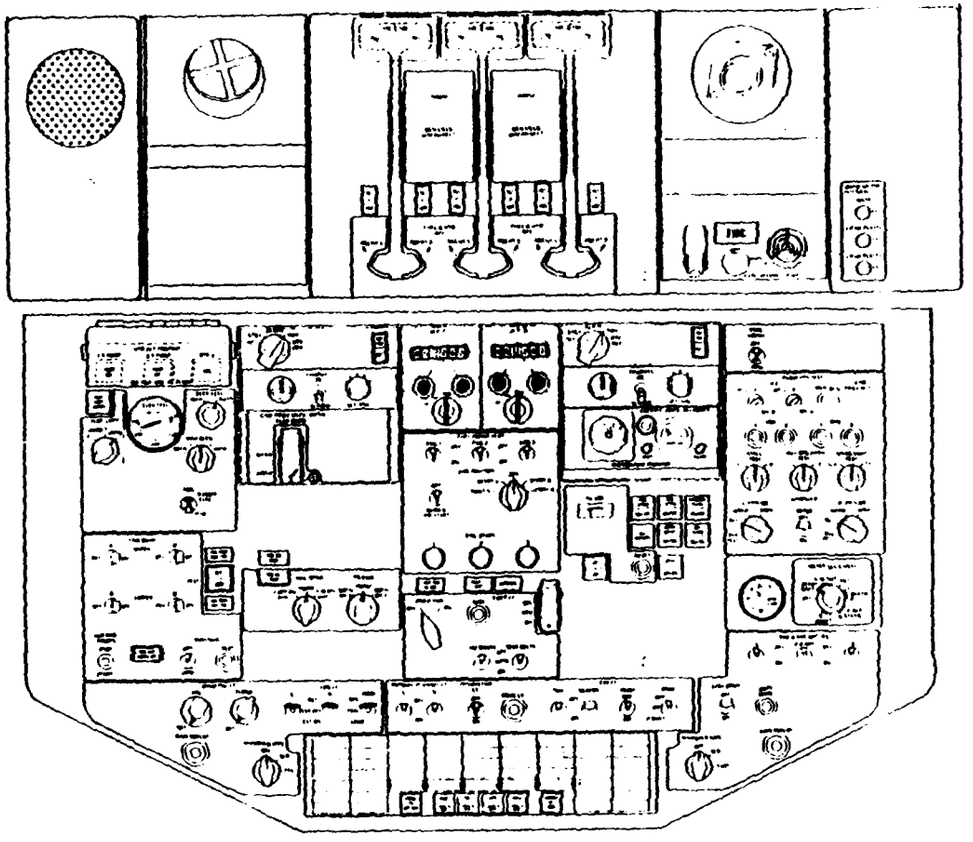
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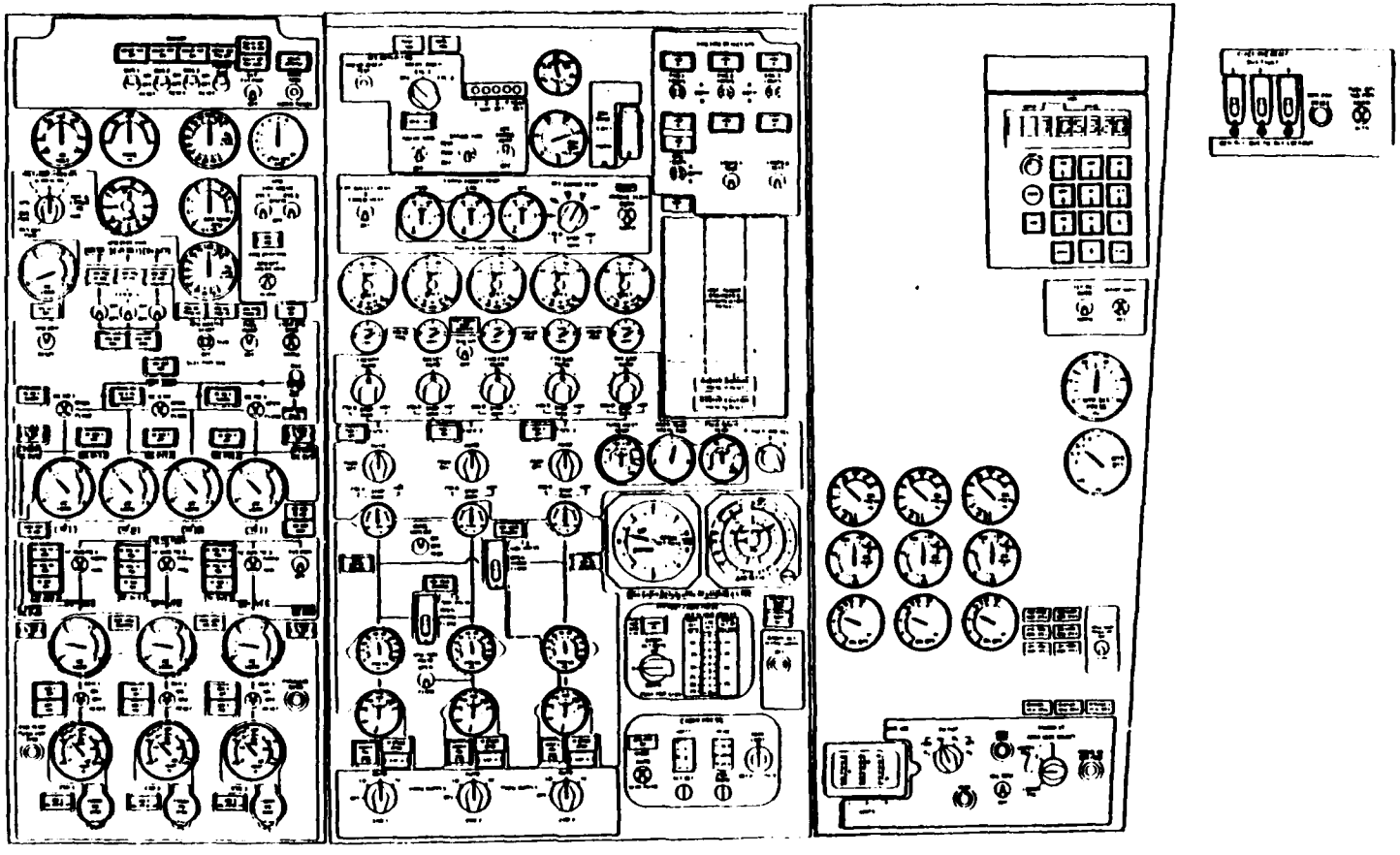
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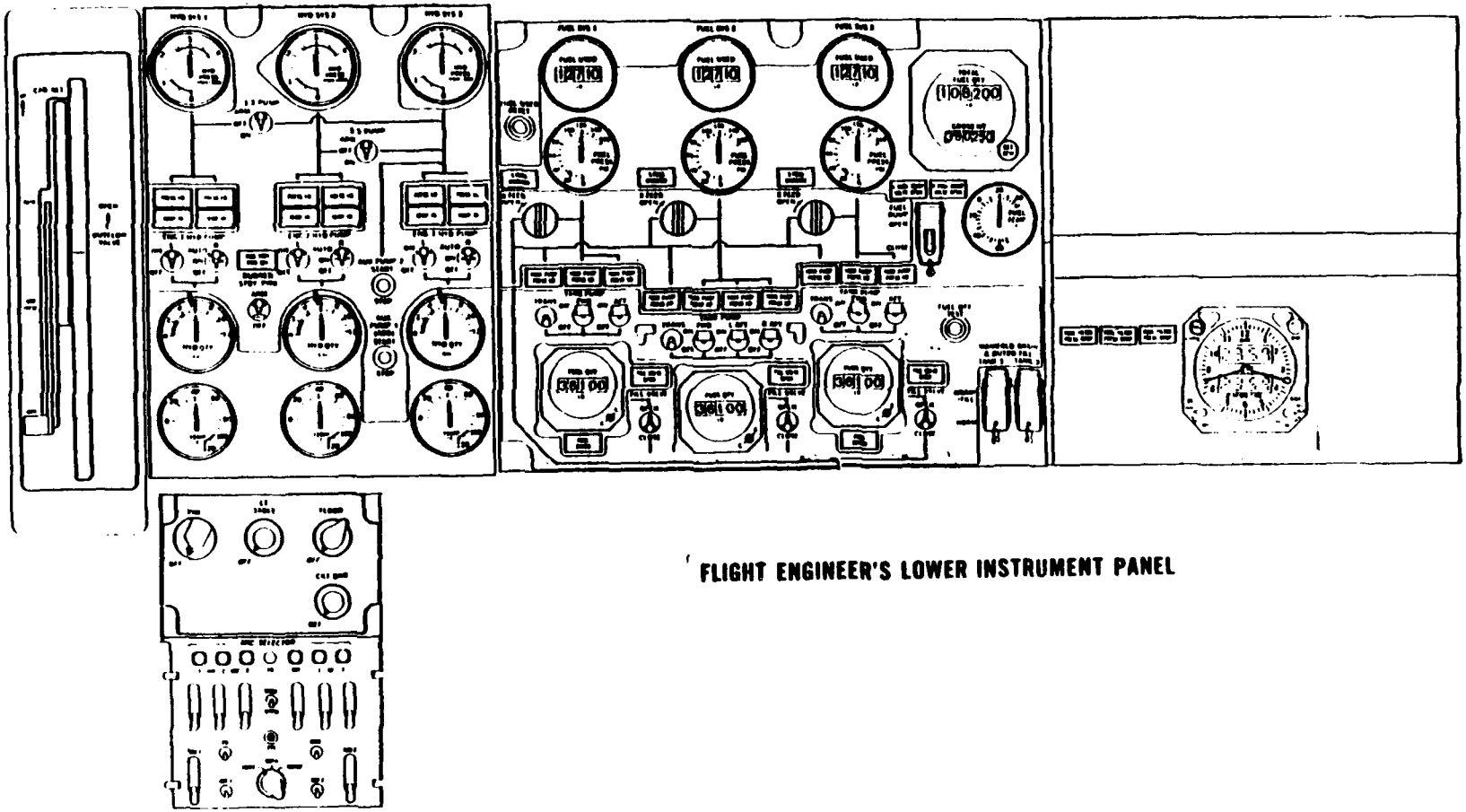


OVERHEAD PANEL



FLIGHT ENGINEER'S UPPER INSTRUMENT PANEL





FLIGHT ENGINEER'S LOWER INSTRUMENT PANEL

DATA LIST

MODEL: FLIGHT 200/15

	DATA	SOURCE	USAGE
	INITIAL PLANNING DATA		
	Master Flight Record Departure time /DEN Arrival time /OPD Equipment type /DC-10	Schedule Drafters	UNIMATIC Data Base
	FLIPO (Flight Information) (This information is kept from four days prior to the flight until two days after)	UNIMATIC	AFPAM (Automated Flight Plan and Monitoring) A/C ROUTING CMS (Crew Management System) AWB (Automated Weight and Balance) FIC (Flight Information Controller)
	Aircraft Routing	UNIMATIC FLIPO AFPAM AMIS (Aircraft Maintenance Info System)	Selection of Airplane
	Crew Management System	UNIMATIC	Selection of Flight and Cabin Crews
	Weather Conditions	Kansas City Suitland ETC.	UNIMATIC Data Base for AFPAM
	Weather Conditions	UNIMATIC	Preparation of Weather Briefing Message
12:05:00	FPF (Flight Plan Forecast)	UNIMATIC	Deliver to Crew Desk 1hr 30min Prior to Flight for Crew Flight Planning " " "
	WBM (Weather Briefing Message)	UNIMATIC	" " "
	DRM (Dispatch Release Message)	UNIMATIC	

FPS (Flight Plan Forecast)

SMUC [illegible]
.SFODNUA 06151152 0713 /KEA

200 15 340/ AFEM SF04 ORDD SF07 [redacted]

01145/01146 B25C E105 A105 H60 MKE DTW RT+19 (P)

TRU

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ICT	33	37	822	04	39	476	24044	043	519	4	9	419
OBH	129	37	821	03	39	475	25046	046	521	15	35	384
FOD	355	37	820	02	39	473	26060	060	533	40	93	291
OBD	133						26037	032		23	21	270

37 3422 01145 258 000 M83

33 3442 01144 271 1300 M83

29 3445 01145 294 XXX M83

27 3423 01144 308 3094 M83

25 3494 01143 323 3094 M83

UA200 H/DC10/A 0476 DEN P1345 370

I#N.JLC.DBD..RFD.V100.FARMM..ORD/0145 (C/S)

(SUBSTITUTE PREFERENTIAL ROUTING) (C/S ALTITUDE IS 37T)

FPS Con't

***

RVSD ALTNS

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OBH	25042+049+02	25046+046+03	25036+036+02	25021+021+03
DBQ	26061+061+01	26060+060+02	26056+056+02	26046+046+03

EISIR 151200 6408 0973

Dispatch Release Message

.UENDD SFO/F
.SFODNUA 06151201 0753/KEA
RLS 280-15JUN92 IFR

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TRU
RVSD ALTNS

ORD-DWT 3405 1117 B176 E98 H40 TTL314 NO 3454
TFC

POSNDI548-82 COLOR RADAR VIDEO TOPS*5A/[illegible] SNOLE [illegible]

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CAPT (PRINT) [illegible] EMP CODE [illegible] DOM [illegible]

CAPT SIGNATURE [illegible]

EISIR 151200 6720 0471

WBM (WEATHER BRIEFING MSG)

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DENCM
..DENCHUA 151633 2912/BRA
WBM  280-15    DEN-ORD              RTG 19          ALTNT MKE DTW
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MAP FEATURES CENTRAL U.S. 1514197-1606007
DVNG LO OVR WIS/ILL BORDER TO MOVE NE 20 KTS THRU LWR MICH TO
LK HURON BY 05Z.CDFNT XTNDS SW FROM LOW THRU NW ILL.MOVG SE KANS
OKLA TO THE TEX PAN HANDL WITH ACTIVE WAVES MOVG NE ALONG
FRONT.STNRY MOVG E 15KTS.R-/R/TRW- MOVG NE AND OF LOW OVR WIS
AND LWR MICH.NRN IND AND NRN OHIO.1SIM ACTVTY WILL CONTN THRU
PERIOD ALONG FRONT AND VCNTY WAVES FROM TEX THRU MO AND THE
OHIO VLY.

---
DEN 145. 1V SCT E41 OVC 25L- 140/53/46/0209/007/LB30
DEN SF 1537 9 SCT M19 BKN 28 OVC 15L- 0209/009
DEN 1554 9 SCT M2A OVC 10R- 148/53/46/0306/009/ LERB 45
DEN 1554 9 SCT M2A OVC 10R- 148/53/46/0306/009/LERB45
DEN FT15 151616 10 SCT 30 BKN UCNL C10 OVC 4R-F. 19Z 20 SCT C40
    BKN UCNL C20 OVC RW- CHC 1RW- 030. 04Z 40 SCT 80 SCT. 10Z
    VFR BLMD MVFR C10 F..
DEN NO A/36 EFF 0800 17L-35R CLSD

DEN NO 13/  CTC WAL RAMP TWR 129.5 105 MINS BEFORE SKD DPTR
    FOR P.C ANTICIPATED DLYS FOR MORE ACCURATE PUSHBACK CLRNC
    & TKOF TIMES. DENFD 4/16/82
DEN NO 13/5 FDC 2/1116 FI/T ILS/DME RNY 8R AMDT 1 S-LOC
    1-OCN 4.4 DME STEPDOWN ALTITUDE 6300 VICE 6200. 5-11-82
DEN NO 13/6 RWY 26L-08R CLSD 15/2200LCL TIL 18/1800LCL FOR
    CONSTRUCTION

ORD 1450 20 SCT E90 BKN 3FH 006/70/67/1714/956/ 74101 1570
ORD SF 1511 20 SCT E90 BKN 3FH 006//0/67/1714/956 74101 1570
ORD SF 1521 M23 BKN 90 OVC 4H 1611G22/954// 8INOVC
ORD 1550 M23 OVC 8 999/76/66/15150022/954/ 8INOVC
ORD FT15 151515 C20 BKN 80 BKN 1915 LYRS BKN V SCT UCNL 3FH TIL
    16Z. 18Z C20 BKN 80 OVC 1915 OCNL C12 OVC 2TRW CHC C5 X
    1/2TRW+0 045+. 09Z IFR C10 R F..
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WBM CONTINUED

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    F-1P REMBRD F-10 .F-1A REMBRD F 1X.ACTV FOR F-2
    018.14R 32L PARR TXWY CLZD BET T5 AND HNGR TIL
    UA1412002.BYPASS CLZD W OF 300 TIL 0530120Z
ORD NO 13/2 TWY U IS INOP ON THE SCENIC TWY FRM OPL EXER TO
    HANGER ALLEY. 14R-32L NL R CLZD FOR ELECT MAINT ALL
    WEEKENDS TIL 7/12 CLOSING FRM FRI 2200LCL TO MON 0700LCL.

MKE 1550 W4X 3/4TR-FH 012/60/59/0605/956/ TR/4 0/8D N050 E 10 TP
    LTGICCG R01VR35U50
MKE SP 1403 W2X 3/4R-FH 0505/956/ TE02 M050 E R01VR50
MKE FT15 151515 C15 BKN 80 OVC 5F 1612 VRBL 210 02K 1RW-F CHC
    TRW-. 18Z C12 OVC 3F 4615 CHC CB OVC 1R-F. 22Z 15 SCT C40
    OVC 0215. 02Z MVFR CIG.
MKE NO 4/9 ILS GS 15R OTS

DTW 1351 45 SCT E100 UNL 10R- 092/48/53/1910/951/R050
DTW SP 1411 E46 BKN 100 OVC 10TRW- 1910/951/ TR11 W MOVG NE
    U NL LTGCG
DTW 1453 4K SCT E100 UNL 7R- 08A/AA/C 2160/2/C/TR11E40 MOVG NE
    / 7200/ 122/
DTW 1607 M150
DTW FT15 151515 C40 BKN 80 OVC 2010 SRFCE BKN V SCT CHC 2TRW-F.
    17Z 15 SCT C20 BKN 2015 BKN V SCT OCNL 3RW- CHC C15 OVC
    2TRW+ 030. 01Z C30 BKN BKN V SCT CIG 5000. 09Z IFR C10 F..
DTW NO 5/10 9L 21L CLZD UNTIL 07/2112Z
DTW NO A/15 9L-27R CLSD

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UA5711 /OV MCW 24 S MCW F350/NV 2380/5 IMS
UA911 /OV MCW 1623 F350/10 MS49/NV 24/073/K 01E/13 CONTRS LT
    CHK
UA191 /OV MCI 10 S 1535 F350/10 MS49/NV 2060/0
UA911 /OV DSM 1552 F350/10 MS47/NV UNKN 2[illegible] OIL DEICED
    SMTH
UA2110DTA /OV DET 1545 F350/10 MS[illegible] 2[illegible] 01E/10 SMTH
```

DATA	SOURCE	USAGE
INITIAL PLANNING DATA COMPLETE		
Planned Fuel	AFPAM	Deliver to Crew Desk 1hr 30min Prior to Flight for Crew Flight Planning
Actual Take Off Gross Weight	AFPAM APOLLO (Passenger Information) FAS (Freight Accounting System)	For Crew Flight Planning and Load Planning
12:35:00		
FLIGHT CREW - PREFLIGHT PLANNING (Crew Reports One Hour Prior to Flight)		
Notices to Airmen	Bulletin Board	Verify Operating Conditions
Field Conditions	" "	" " "
Assignment of Duties	Captain	Conduct of Flight
Flight Control Transfer	"	" " "
Radio Operation	"	" " "
P.A. Announcements	"	" " "
Company Reports	"	" " "
Weather Turb., precip., low ceilings, icing, wx trends, wind, delays and alternate information	WBM Terminal Forecasts Severe Weather Warnings CAT (Clear Air Turb) Forecasts SIGMETS & Surface charts	Captain and First Officer Verify Safety and FPP Dispatcher Also Verifies Independently
12:45:00 Second Officer departs for the airplane		To begin preflight.
FPP (FLIGHT PLAN FORECAST) Radio, flight and airplane numbers, date, dept., arr., and controlling dispatch sectors and FPP number	UNIMATIC	Flight planning and Conduct of Flight by the Crew and by Company Flight Following

	DATA	SOURCE	USAGE
	FPF CONT'T planned flight time, sched. target time, planned fuel burn, FAR fuel reserve, reason for alt. and holding fuel, mileage, planned take off wt. allow. operating weight, planned landing weight, max. allow. landing weight, temperature dev., wind comp., ZFW, station where fuel boarded, fuel required and total fuel. Flt plan check points, seg. mileage, flt. level, mach, tropopause hgt., TAS, wind, grnd speed, seg. time, seg. fuel burn and fuel remaining. Wind for descent.	UNIMATIC	Flight Planning and Conduct of Flight by the Crew and Company Flight Following
	Flight identification number, FAA type and equip., TAS first seg., dept. station, planned dept. time, flight level first seg., planned route, and estimated time enroute.	UNIMATIC	Required by ARTC (Air Route Traffic Control)
12:55:00	MEL/CDL	UNIMATIC	Verify Airworthiness
	TOSROs (Operationally important msgs)	UNIMATIC	Conduct of Flight
13:00:00	DRM (Dispatch release Message) Captains Minimums Code Crew airport Qualification	Dispatcher Captain "	To Release the Flight *Captain and First Officer depart for the airplane.*
	AIRPLANE CONDITION - PREPARATION FOR FLIGHT		
	Inbound Condition of Airplane	Inbnd. Flight Crew Log Book Deferred Items Required Service	Verify Airworthiness - Second Officer meets in bound crew to inquireabout condition, checks the log book and relays the information to the captain and First Officer.

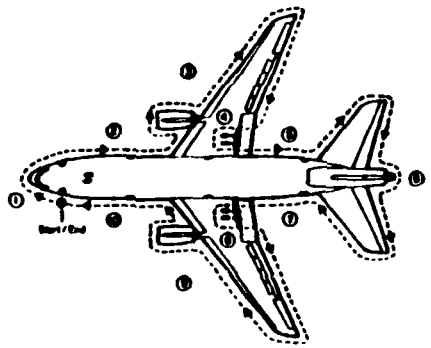
DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
11:00:00 S.O.'s preliminary cockpit preparation	SOP - S.O.	Verify airworthiness.
Battery switch - on	SOP - S.O.	Establish power for starting the APU.
Circuit breakers - in	SOP - S.O.	Reset breakers pulled after the last flight.
Fire warning system - test	SOP - S.O.	Verify system is operational.
A & B test sws - test	SOP - S.O.	Verify system is operational.
Engine & APU fire lts - on		
Loop lights - on		
Master warn lts - on		
Engine fire bell - sounds		
APU (Aux. power unit) - start	SOP - Flight handbook - S.O.	To provide electrical and pneumatic power.
Ing. ignition sws - off	SOP - S.O.	Prevent unwanted ignition (possible fire hazard).
APU isolation valve - closed	SOP - S.O.	Protect APU from pneumatic loads before it is stable.
APU gen bus sws, 1, 2 & 3 - off	SOP - S.O.	Prevent electrical loads before stabilization.
Fire control sw - normal		
Control sys sw - normal		
Oil Quantity - 4 qts min	Flight handbook - S.O.	Verify sufficient oil for operation.
APU fuel pump switch - on	SOP - S.O.	Provide fuel pressure.
Master switch - run		Opens inlet doors.
Door open light - on	Annunciator panel _ S.O.	Verifies door open.
Master switch - start	SOP - S.O.	Begins the start cycle.
APU oil press lo lt - on	APU panel - S.O.	Checks the light for auto shut down capability.
N1,N2 and EGT ind's. rise	APU panel - S.O.	Normal start cycle indications.
APU oil press lo and gen off lts - out	APU panel - S.O.	Indicate normal operation.
APU generator bus sws - on	SOP - S.O.	Powers the airplane electrically.
#2 left aft fuel pump on, APU fuel pump off	SOP - S.O.	Saves wear on the APU fuel pump and verifies condition of the #2 left aft pump. (This pump is required to operate #2 engine in the event of electrical power failure.)
Safety check:	SOP - S.O.	Assure that not flight controls movewhen the hydraulic system is pressurized and that the gear handle is down.
Gear handle - down		
Slat reset light - out		
Flap/slat handle - up/retract		
Hydraulic quantity checked - normal and bugs set to quatity ind.	SOP - S.O.	Verify sufficient quantity for the flight. The bugs assist in monitoring.

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Rudder standby power switch - armed	SOP - S.O.	Prepare to test the system. Permits pressure from #3 Hyd. system to operate the bottom rudder normallyy powered by #2 & the top rudder from #2.(norm. #1)
Aux pump 1 - on	SOP - S.O.	Powers #3 hydraulic system.
Bottom rudder - moves slightly	Flight control position ind. - S.O.	Verifies operation of the 3-2 rudder standby power.
Aux pump 2 - on	SOP - S.O.	Provides more hyd. flow capability.
Aux pump 1 & 2 on lts - on	Annunciator panel - S.O.	Verifies both pumps on.
2-3 motor pump - armed	SOP - S.O.	Powers #2 hyd system from #3.
Top rudder & bottom rudder - center	Flight control position ind. - S.O.	Verifies both rudder standby systems operative.
Rudder standby power switch - off	SOP - S.O.	Save pump wear and noise.
1-3 motor pump - armed	SOP - S.O.	Powers #1 hyd system from #3.
Hyd press 1,2 & 3 - 3000 PSI	Hyd panel gages - S.O.	Verifies power is normal for cockpit checks.
Galley power switches - on	SOP - S.O.	Establish galley power for cabin crew.
Galley overheat light - out	SOP - S.O.	Verify normal condition.
Pneumatic manifold fail/test lts - press one at a time:		
#1 lights up 1 & 2	Pneu panel - S.O.	Verifies #1 and part of #2 warning system operable.
#2 lights up		Verifies the remainder of #2 is operable.
#3 lights up		Verifies #3 warning system is operable.
APU isolation valve sw - open	SOP - S.O.	This switch opens the APU isolation valve and the 1-2 and 1-3 isolationvalves permitting air from the APU compressor to pressurize all three pneu systs.
Airconditioning pack sws - auto	SOP - S.O.	Cool electronic equip and the passenger cabin.
Cabin temp selectors - approx 72°	SOP - S.O.	Temperature control.
Lav/galley vent and cargo heat switch - on	SOP - S.O.	Provide ventilation in the galley and heat the cargo comp.
Quantities checked:	SOP - S.O.	Assure adequate service for the flight.
Oxygen - approx 1650 PSI	Handbook limit sect. - S.O.	
water - reasonable amt.		
engine oil - min 14 qts	Handbook limit sect. - S.O.	
Pedestal and center inst. panel check:		
Air driven gen. handle - stowed	SOP - S.O.	Should be stowed and safetied.
Aileron & rudder trim - zero		Verify proper setting.
radar - stdby		Verify warm up and not radiating.
Park brake - set		Assure airplane will not move.

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Brake press - normal	Brake press gages - S.O.	Verify brakes are powered.
Stabilizer trim sws - nose up	SOP - S.O.	Check stabilizer trim system.
Trim indicator - moves toward up		Verifies trimming in proper direction.
Stabilizer trim sws - nose down		" " " " "
Stabilizer trim sws - split or one at a time up and down (check is done on Captain's, F.O.'s and alt. sws and the manual trim handles.)		Verifies runaway protection is functional.
Spoiler handle - retracted	SOP - S.O.	Spoilers stowed.
Spoiler tapes - zero	Flight control position ind - S.O.	Verifies spoilers are stowed.
Fuel levers - off	SOP - S.O.	Preclude fuel from flooding the engines.
N1 thrust computer - T.O.	SOP - S.O.	Set for take off.
Engine instruments - checked: Max pointers - aligned	SOP - S.O.	Verify condition and assure no limits have been exceeded.
Over head panel checked:		
Hyd flight control lts - off	SOP - S.O.	Verify flight controls will be powered.
Elevator feel & flap limit sws - norm.	SOP - S.O.	Set for flight
ADC switch - hydraulic		
Yaw damp sws - on		
Yaw damp test switch - press	SOP - S.O.	Test yaw damper operation.
All yaw damp and yaw damp test lts - on, then off.	Annunciator panel - S.O.	Verifies operation.
Anti skid switch - on	SOP - S.O.	prepare to test the anti skid system.
Anti skid test switch - press/release	SOP - S.O.	Test.
Anti skid fail lts on/then off	Annunciator panel - S.O.	Verifies proper operation.
Vertical gyro and flight director command sws - normal	SOP - S.O.	Set for flight.
GPWS inhibit sw - safetied	SOP - S.O.	Verify system armed.
Capt's compass slaved	SOP - S.O.	Assure correct nav information.
INS 1 MSU - align	SOP - S.O.	Warm up INS.
Voice recorder test button - press	SOP - S.O.	Verify operational.
Voice recorder monitor - flips twice	Recorder panel - S.O.	" "
Install headset, speak and listen for play back	SOP - S.O.	" "
Engine ignition sws - all off	SOP - S.O.	Preclude unwanted ignition.

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Emergency light sw - armed	SOP - S.O.	Turn system on so it will provide exit signs and lights in event of power failure.
Emergency light test button - press and hold for approx 3-4 secs.	SOP - S.O.	Tests the batteries and lights.
Emergency lights and green test lt - on	Emerg lt panel - S.O.	Verifies system operational and batteries good.
Emergency power switch - on	SOP - S.O.	Test emergency power capability to power the Captain's instruments.
Emergency power in use lights - on	Overhead and S.O.'s panels - S.O.	Verify system is on.
Captain's instruments - working	Forward inst panel - S.O.	Verify system is working.
Battery ammeter shows - discharge	Electrical panel - S.O.	Verify battery is powering the emerg system.
No smoking switch - on	SOP - S.O.	Prohibit smoking in the cabin.
Seat belt sign switch - off	SOP - S.O.	
Evac command switch - off	SOP - S.O.	
Evac signal switch - armed	SOP - S.O.	Insure system is armed if needed.
INS 2 MSU - align	SOP - S.O.	Warm up INS.
F.O.'s compass switch - slaved	SOP - S.O.	Assure correct navigational information.
With hand set out of it's mount, press the PA switch and make a test call, should be clear.	SOP - S.O.	Verify system works.
Pitot heat switch - select each position, read proper amperage.	SOP - S.O.	Verify each position is heating except the TAT.
Exterior light sws - on	SOP - S.O.	Prepare for external inspection.
Annunciator lights test sw - press	SOP - S.O.	Verify operational.
INS 1 & 2 control/display units - test:		
INS 1 & 2 radio/INS sws - INS	Handbook - S.O.	Display INS info on the HSI's.
DATA selectors - position		Prepare for test.
Test switch - hold		Test
Data displays - all 8's + NSEW		Verifies all lights work.
Key lights - on: Hold, remote, insert, alert, bat, warn and waypt change.		
Indicator lights on the MSU - on: Ready nav & bat		
Course ind (HSI) - 0°		Verifies instrumentation operational in INS.
Heading and course bugs - 0°		
Deviation bar - 1 dot right		

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Emergency equipment check: Fire extinguisher - in bracket Portable oxygen - mask attached and in bracket Crash axe - in bracket 5 smoke goggles in pouches 2 escape ropes in overhead compartments	SOP - S.O.	Confirm emergency equipment aboard, properly stowed and in good condition.
13:10:00 Spare bulbs and 1 hand mic avail.		
Second Officer's exterior inspection Nose section/gear area Air cond. pack inlets Stall warning vanes Oxygen thermal discharge disc Pitot heads Radome Gear area Doors Taxi lights Tires Wheels Ground shift rod Strut extension Steering bypass valve Gear down lock pin Total air temp probe External air cond. access doors Right forward fuselage Main landing light Air cond fuselage door Air cond pack outlet door ADG door Static ports Cabin pressure relief valve vents Forward cargo door Cabin pressure relief valves Center accessory compartment door Wing and runway turnoff lights	Direct examination	Verify air worthiness



DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Second Officer's ext. insp. con't	Direct examination	Verify airworthiness
Right wing and engine 3		
Wing fillet vent hole		
Inboard slats		
Engine 3		
Cowling		
Accessory doors		
Fins		
Inlet		
Blades (fan and compressor)		
Accoustical material		
Spinner		
Fan air passage		
Exhaust port		
CSD oil cooler		
Flap supports		
Access and service doors		
Fuel tank vent		
Outboard slats		
Wing tip and lights		
Static discharge wicks		
Fuel dump tube		
Flaps		
Ailerons		
Fuselage beacon lights		
Right main gear area		
Tires		
Wheels		
Strut extension		
Brake lines		
Gear doors		
Anti-skid assembly		
Leveling cylinder		
Gear down lock pins		
Grounding strap		
Right aft fuselage		
Center cargo door		
Engine 2 area		

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Second Officer's ext. insp. con't	Direct examination	Verify airworthiness
APU area		
Intake and exhaust		
Doors		
Tail area and engine 2		
Work platform		
Elevators		
Stabilizers		
Rudders		
Static discharge wicks		
Engine 2		
Cowling		
Tail cone		
Left aft fuselage		
Aft cargo door		
Left main gear area		
Tires		
Wheels		
Strut extension		
Brake lines		
Gear doors		
Anti-skid assembly		
Leveling cylinder		
Gear down lock pins		
Grounding strap		
Left wing and engine 1		
Ailerons		
Flaps		
Fuel dump tube		
Static discharge wicks		
Wing tip and lights		
Outboard slats		
Fuel tank vent		
Access and service doors		
Flap supports		

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Second O. Ler's ext insp. con't	Direct examination	Verify airworthiness
Engine 1		
Cowling		
Accessory doors		
Fins		
Inlet		
Blades (fan and compressor)		
Accoustical material		
Spinner		
Fan air passage		
Exhaust port		
CSD oil cooler		
Inboard slats		
Wing fillet vent hole		
Left forward fuselage		
Wing and runway turnoff lights		
Pressure outflow valve		
Butterfly valve		
Ramshield assembly		
Static ports		
Potable water service door		
Airconditioning pack outlet doors		
Air conditioning fuselage doors		
Main landing light		
13:15:00 Return to cockpit		
Weight and balance form handed to S.O. by ground personnel		

PLANNED WEIGHT MANIFEST

DPWM 280-15JUN	DEN	3406	LOADED IAW 78-051	DEN04*J PITI	
OWE	245444		XTOC	373400	
PITS	14389		%MAC	22.7.....	
F 20.....	3540				
R 151.....	26727				
ZFW	290100				
FOB/TAXI	53700/800				
TOC:	343000				
;06151158					

UNITED AIRLINES

UA STATION FREQUENCIES

1	2	3	4	5	6	7	8
Station	a) Ladder & Arrival Time Rpt. - pg. 130 b) Dept. Time Rpt. - pg. 128 Ground Delay Rpt. - pg. 133 Ground Sched Wdrs - pg. 127 Pilot/Dispatcher Confidex - pg. 138	(a) Off Time Report - pg. 130	Gate Assignment - pg. 134 Pre-Dept.Comm - pg. 128 Wt. &Ballast Ch. - pg. 139	Airborne Gate Assignment & Passenger Connection Info. - pg. 134	Airport Elevation		VEF Nav Rsvr Ground Check - pg. 68.5
DEN	129.45	129.45	129.5(c)	131.35	5333	125.0 arr	T-110.0
	-	130.2	128.4(d)	-	-	-	-
	130.2	130.4	-	-	-	-	-
	130.4	130.6	-	-	-	-	-
	130.6	-	-	-	-	-	-
DFW	131.65	131.65	-	-	5[illegible]	135.8 dep	-
	128.9	-	-	-	-	[illegible] arr	-
	-	-	-	-	[illegible]	-	-
	-	149.4	-	-	184	118.[illegible]	-
	130.62	130.62	130.8	-	020	120.35	-
HNI	131.95	131.95	130.3	-	13	120.7	T-[illegible]
RSV	130.2	130.2	-	-	020	121.25	-

(a) No frequency priority intended, your enroute frequency may be used if listed.
(b) EVR - All aircraft use 129.55 in flight, after landing confirm gate on 129.5 and monitor until blocked.
(c) DEN - 129.5 gate assign. and until blocked, predeparture comm; pushback clearance B Concourse gates. B 757 do not use Accu-Park, signalman required.
(d) DEN - 128.4 wt. manifest check.
(e) PKO, FLY - Local station Comm. Frequency - 129.5.

13 01 00

UNITED AIRLINES FUEL SERVICE FORM

3406	280	/15	DEN	Jet

TANK NO	FUEL DISTRIBUTION (LBS) ORDER	DISPATCH	ACTUAL	STICK INCHES & LOCATION DISPATCH	ACTUAL	FUEL TO BE ABOARD
OUTBD AUX RESV						CLEARED FUEL 52.6
MAIN	5800	17,800	17,900			TAXI FUEL .8
ALT						TOTAL FUEL REQUIRED 53.4
MAIN	5700	17,800	17,900			REMAINING FUEL
CENTER						BOARD 53,400
AFT AUX						DEFUEL 17,400
MAIN	5900	17,800	17,900			
ALT						
MAIN						
OUTBD AUX RESV						
TOTAL PRE SERVICE FUEL	TOTAL ACTUAL FUEL					
17,400	53,700					36,000

	8 5338
	5338
DOI	5294
	267 4/4

J Jones

UO [illegible] Rev 8 77

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Second Officer's cockpit preparation:	Direct examination - S.O.	Verify airworthiness and set up systems for flight.
Exterior lights - off (day)		
Oxygen mask - put on and adjust		Assure that it fits.
Mask controls - set to normal/100%		Verify oxygen flows properly.
Mask/boom switch - boom	Jack box - SOP - S.O.	Prepare to test mask mic.
PA mic selector - press	" " " "	" " " " "
Push to talk button - press and xmit, listening to the PA system	" " " "	Verify mask mic and PA system work.
Oxygen mask - stow on hanger	SOP - S.O.	Makes mask instantly available if needed.
VHF COM 2 - tune to 124.45	FOM (see page 23) - S.O.	Prepare to receive ATIS information.
ATIS information - copy	Automated terminal information system - S.O.	Preparation of take off data card.

STAPLETON INTERNATIONAL AIRPORT DEPARTURE INFORMATION QUEBEC - ALL AIRCRAFT CONTACT CLEARANCE DELIVERY ON 127.6. 1315 GREENWICH WEATHER 1900' SCATTERED, 4000' OVERCAST, VISIBILITY 5 MILES IN LIGHT RAIN, TEMPERATURE 53, DEW POINT 46. WIND IS 020° AT 7 KNOTS, ALTIMETER 3007. DEPARTING RUNWAY 35 LEFT, RUNWAY 17 LEFT - 35 RIGHT CLOSED. UPON RECIEVING YOUR ATC CLEARANCE, READ BACK ONLY YOUR CALL SIGN AND TRANSPONDER CODE UNLESS YOU HAVE A QUESTION ABOUT THE CLEARANCE. ADVISE CLEARANCE DELIVERY WHEN READY TO TAXI THAT YOU HAVE INFORMATION QUEBEC.

Weight manifest - on board	Load planning (see page 22) - S.O.	Preparation of take off data card
Fuel sheet - on board	Refueling sect. (see page 23) - S.O.	Confirm correct fuel load.
Log book - on board	Maintenance - S.O.	Confirm airworthiness.
Hydraulic system - check	SOP - S.O.	Verify system operation is normal.
Temperature - normal	Hydraulic panel - S.O.	Verify normal operation.
left eng driven pump sws - on	SOP - S.O.	Ready for flight.
Right eng driven pump swa - auto		On standby in the event of left pump failure.
1-3 & 2-3 motor/pumps - off	SOP - S.O.	Save wear and reduce noise in the cabin.
Systs 1 & 2 pressure - zero	Pressure gages - S.O.	Verify motor pumps are off.
Syst 3 pressure - approx 3000#	" " - S.O.	Verify aux pumps running.
Aux pump 1 - off	SOP - S.O.	To check #2 pump pressure.
Syst 3 pressure - still normal	SOP - S.O.	Verifies #2 pump pressure.
Aux pump 2 - off	SOP - S.O.	Shut down the system.
Syst 3 pressure - zero	Pressure gage - S.O.	Verify #2 did shut off.
Aux pump on lights - off	Annunciator panel - S.O.	Verify indicator lights work.
Temp hi lights - off	Hyd panel - S.O.	Verify normal operation.
Press lo lights - on	" " - S.O.	Verify lo lights are functional.

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Second Officer's cockpit prep con't		
Electrical system check:		
CSD's:		
Oil press lo lts - on	SOP - S.O.	Verify lo lights are functional.
Switch guards - closed & safetied	Elect panel - S.O.	Guard against inadvertent disconnect.
Temperature - normal	Temp gages - S.O.	Verify system normal.
Generators:		
Fail lights - off	Elect panel - S.O.	Indicate generator bearings and circuitry are okay.
Off lights - on	" " - S.O.	Indicate generators are not running.
Switches - on	SOP - S.O.	Ready for operation.
AC loads - zero	Elect panel - S.O.	Normal condition.
Bus off lights:	" " - S.O.	Indicate normal elect power on the associated bus.
Lt emer bus - off		
Rt emer bus - off		
AC buses 1,2 & 3 - off		
Bus tie amber isolation lights - on	Elect panel - S.O.	Indicate that the AC tie is not powered at this time, since the APU powers each bus individually and does not utilize the tie.
Bus tie blue isolation lights - off	Elect panel - S.O.	Indicate that auto land power is not in use.
Dual land selected and power on lts - off	Elect panel - S.O.	Indicate that auto land power is not in use.
AC bus tie sws - normal	SOP - S.O.	Provide automatic switching to keep all buses powered during flight in the event of certain electrical failures.
Emergency pwr in use light - off	SOP - S.O.	Emergency power not in use.
DC loads - normal	Elect panel - S.O.	Verify Normal DC power available.
DC bus off lights - off (left & right emer bus and buses 1, 2 and 3)	" " - S.O.	Indicates all DC buses powered.
DC tie sws - open	SOP - S.O.	Isolates the DC buses for normal operation.
DC tie closed lts - off	Elect panel - S.O.	Verifies the DC buses are isolated.
Battery sw - on	SOP - S.O.	Battery will charge and be ready to power certain equipment if needed.
Volt/amp/freq sel - bat & lt emer bus	SOP - S.O.	So battery and left emer bus power can be monitored.
Volts and freq - norm	Elect panel - SOP	Monitor for normal operation.

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Second Officer's cockpit prep con't		
Fuel system test and set;	SOP - S.O.	Confirm condition and set for flight.
Any X-feed switch - open	SOP - S.O.	Check for refueling panel condition.
X-feed disagree lt - on then off	Fuel panel - S.O.	Indicates valve opened.
X-feed valve sw - closed	SOP - S.O.	Returns valve to normal position, for flight.
X-feed disagree lt - on then off	Fuel panel - S.O.	Indicates valve closed.
NOTE: If the refueling panel is not properly stowed the X-feed valves will not work.		
X-feed valve sws - all closed	SOP - S.O.	Set for flight.
X-feed disagree lts - all off	Fuel panel - S.O.	Set for flight.
Fuel schedule lights - off	" " - S.O.	Verifies fuel is properlystored in the outboard compartments of tanks 1 & 3.
Fill valve sws - closed	SOP - S.O.	Set for flight.
Fill valve open lights - off	Fuel panel - S.O.	Fueling valves are closed.
Fuel quantity - check	SOP - S.O.	Confirm the correct amount is in the tanks, compare With flight plan and totalizer.
Fuel quantity test button - press	SOP - S.O.	Tests gages for proper operation.
Quant gages - test to 99,900	Handbook - S.O.	
Totalizer - tests to 299,600		
Fuel manifold drain sws - safetied	SOP - S.O.	Verify closed.
Tank pump sws - off except one #2 pump for the APU	SOP - S.O.	Normal operation, the APU will not run without fuel pressure.
Pressure low lights - off	Fuel panel - S.O.	Lights are disarmed with the switches off. Number 2 aft pump sw is on but the light is out as the pump is producing adequate pressure.
Fuel dump switch - closed	SOP - S.O.	Closed for normal operation.
Fuel used reset button - press	SOP - S.O.	Resets fuel used gages to zero so accurate recording of fuel used will be possible.
ZFW knob - hold in and rotate to set the zero fuel weight in the ZFW window.	ZFW from the weight manifest - S.O.	Setting the zero fuel weight in the window allows the airplane gross weight to be read when the button is released.
Zero fuel weight - 290.1	Weight manifest - S.O.	Will be added to fuel in the totalizer window.
Gross weight - 343.0	Flight plan - S.O.	Indicator should agree with the flight plan.
pneumatic and air conditioning systs:		
Bleed sws - off	SOP - S.O.	Off for engine start and pneu. air is furnished by the APU.
Temp and press gages - normal	Pneu panel - S.O.	System check.

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Second Officer's cockpit prep con't		
Pneu. and air cond.systs con't		
Isolation valve sws - normal	SOP - S.O.	Permits automatic control of the valves by the APU Valve switch.
Disagree lights - off	Pneu panel - S.O.	Indicates that the isolation valves are in the selected position.
Flow gages - normal	" " - S.O.	Indicate amount of air flow through the packs.
Wing anti ice sw - off	SOP - S.O.	Must be off on the ground.
Wing anti ice disagree lt - off	Pneu panel - S.O.	Verifies the valves are closed in agreement with the switch.
Pack off lights - off	Pneu panel - S.O.	Verify packs are operating.
Pack indicator selector - to each pack in turn: Turb inlet temp - normal Pack temp valve - normal Pack discharge temp - normal	SOP - S.O.	Confirm normal operation of each pack.
Compartment temp selectors - auto at approx 72°	SOP - S.O.	Maintains the cabin compartments at selected temp.
Trim air switch - on	SOP - S.O.	Provides fine temperature trimming between cabin compartments.
Duct/avionic overheat light - out	Panel - S.O.	Indicates normal temperatures in ducts and the avionic compartment.
Duct temperatures - normal	Panel - S.O.	Monitoring.
cabin compartment temps - app. 72°	Panel - S.O.	Passenger comfort.
Oxygen mask switch - safetied	Panel - S.O.	Prevent inadvertent deployment of the passenger oxygen system.
Avionic flow switch - normal	SOP - S.O.	Provide cooling airflow to avionic equipment.
Pressurization controls set:		
Mode switch - auto	SOP - S.O.	Provide automatic cabin pressure control.
Altitude scale - set to 667' (Chicago fld elev)	Approach plate - S.O.	Will schedule the cabin to destination elevation automatically on descent.
Rate limiter - set to index	SOP - S.O.	Provides normal cabin altitude change rates.
Indicator lights:	SOP - S.O.	Assures normal operation.
Standby on light - off		Standby system not engaged.
Cabin alt light - off		Cabin below 10,000'.
press relief light - off		Cabin below max differential pressure.
Cabin alt rate ind - zero	Panel- S.O.	Monitor cabin after take off.
Cabin alt ind - 5,330'	Den approach plate - S.O.	Cabin should indicate field elevation unpressurized.

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Second Officer's cockpit prep con't		
Differential press gage - zero	Panel - S.O.	Verifies cabin not presaurized.
Baro set scale - set 30.06	ATIS - S.O.	No effect on cabin pressure controller but lets the alt gage show the correct elevation.
Master caution and warning lights - press to reset if on.	SOP - S.O.	Resetting makes them available for subsequent warnings.
Second Officer's clock - set	ARINC or WWV - S.O.	provide correct time.
Annunciator lights test:		
Area test select knob to:		
Lower panel - test	SOP - S.O.	Lights all annunciators on the lower panel.(Hyd & fuel)
Upper panel 1 - test		" " " on upper panel one.(Elec & APU)
Upper panel 2 - test		" " " on upper panel two.(Pneu & A/C)
Upper panel 3 - test		" " " on upper panel 3 (Annunciators)
Reverser valve open lights - out	Panel - S.O.	Reverse mechanism normal.
Cargo door light test sw - test (Lights come on and go out as switchis released.)	SOP - S.O.	Verifies cargo door warning lights are functional.
Engine oil temp - ambient	Panel - S.O.	Gages should show ambient unless engines have been running.
Oil press - zero	Panel - S.O.	Should be no pressure.
Flight recorder - test and set	SOP - S.O.	Confirm operating condition and load trip information .
Test button - hold in		
Recorder off lt - off	Panel - S.O.	Test indication.
Ident annunciators - 8's	" - S.O.	Test indication, also shows all elements of the read-out are operationsl.
Override/normal switch - Ovrd	SOP - S.O.	Prepare to enter data
Trip key - press	SOP - S.O.	Identifies information to be entered.
Ident window - displays 1	SOP - S.O.	Indicates data to be entered is the trip number.
Trip number - key in 00280	Trip number/FPF - S.O.	Loads information in the value window.
Value window - shows 00280		Verify trip number correct (must have 5 digits)
Enter key - press	SOP - S.O.	Enters information on recorder tape.
Date key - press and enter date 06152 (Jun 15 82) in the same manner	SOP - S.O.	Confirms and enters date on tape in the same manner.
Override/normal switch - normal	SOP - S.O.	Returns recorder to normal operation so it will start to record with an engine running and the park brake off.
Maintenance interphone sw - off	SOP - S.O.	Assures in normal position.

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Second Officer's cockpit prep con't		
ACARS flight information - load	SOP - S.O.	Set up for auto reporting of out, off, on and in times and fuel information.
VHF com 1 & 2 - detune 131.55	SOP - S.O.	ACARS uses this frequency and it would interfere if tuned in either set.
Data mode key - press	SOP - S.O.	Selects data mode for next step.
Data mode key - lighted	SOP - S.O.	Indicates mode is active.
Link test key - press	SOP - S.O.	Tests equipment and aligns the time with ARINC
Data display, ind lts, and key lts come on and go out as the test key is released, except the data key will remain on.	SOP - S.O.	Confirms operation of all indicators and lights.
(The following keys will light up when pressed to enter data and will go out as the enter key is pressed.)		
FLT NO key - press and note old trip # in the display.		
CLR key - push	SOP - S.O.	Erases old number from the display.
Key in - 280 and read in the display.	SOP - S.O.	Check number before entering.
Enter key - press	SOP - S.O.	Enters trip number in ACARS memory.
DEP key - press, clear display, and use station aws to enter DEN (departure station)	SOP - S.O.	Confirm correct sta letters before entering.
Enter key - press	SOP - S.O.	Enters departure station in memory.
DEST key - press and enter dest letters (ORD) in the same manner	SOP - S.O.	Enter destination station in the memory.
FUEL/LNDG key - press and observe FO (fuel on board) in the display, key in 537 (53,700#)	SOP/fuel totalizer - S.O.	To enter fuel information in ACARS memory.
ENT key - press and observe FB (fuel boarded) in the display, key in and enter 5294	5294 gallons from the fuel sheet - S.O.	" " " " " " "
13:25:00 Gross weight - compare FPE GW with the weight manifest.	SOP - S.O.	Assure correct information for take off data card. Confirm no changes affecting burnout than provided for with contingency fuel.

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Second Officer's cockpit prep con't		
Take off data card		
	Handbook, Gross weight manual, temperature, pressure altitude, flap setting, gross weight and CG.	Compute safe speeds for take off and climb.
Flap setting selection - 5	S.O. & Captain - hand book	Provide safe & economical setting.

T.O. FLAPS (5)

V_1

V_R

FLAPS ZERO

RET SLAT

CLEAN EXIT SPEED

CG

(343.0)

N_1

ANTI

DC-10 CF6-6D

FLAP — **DENVER (DEN)**

GROSS WEIGHT

OAT DEGREES C	80	120	160	200	240	280 A	320	PRESS ALTITUDE
-40	403.7	402.5	402.5	396.5	391.7	436.5	480.1	395.5
-30	399.3	401.5	426.8	396.2	438.2	432.6	476.8	395.0
0	395.6	400.8	425.8	392.8	400.3	427.5	471.3	395.0
10	391.5	400.8	421.2	389.9	407.2	423.1	465.8	395.0
20	387.4	396.3	417.5	387.7	403.2	418.7	462.3	395.0
30	383.3	392.8	413.5	384.1	404.0	414.4	458.5	395.0
40	380.1	389.6	410.5	385.1	404.0	414.4	458.5	395.0
50	376.5	386.5	406.5	382.0	402.5	410.1	399.8	395.0
60	372.4	384.6	406.2	380.2	401.5	407.6	398.6	395.0
70	368.3	382.5	402.5	378.6	400.0	406.0	397.0	395.0
80	364.2	380.5	398.5	375.5	398.0	402.5	395.0	395.0
90	360.0	378.6	394.8	373.6	396.0	398.8	394.5	395.0
100	356.0	376.2	391.2	371.2	394.0	396.0	394.0	395.0
110	352.0	374.2	387.5	369.2	392.0	394.0	393.0	395.0

NOTE A - These weights based on start of take-off May 30th or later. Use of reserves 7.6 with 30 to 500 feet available

LOWEST	420	370	370	320	460	360	440	0
HIGHEST	420	360	460	400	390	480	390	100
LOWEST	3710	3670	3760	4230	5320	5360	5605	0
HIGHEST	3460	3660	5090	5130	5560	5970	5660	100

RUNWAY LIMIT

1. Zero wind weights shown under runway heading
2. Check for special engine failure on takeoff procedure (code T) or other restrictions

PERFORMANCE LIMIT

Performance limit for all runways shown in far right column of takeoff weight table

STRUCTURAL LIMIT

3X01 3X32 & 3X41-3X47

Taxi	413.0
Takeoff	410.0
Zero Fuel	310.5

Provide safe operation with economical fuel consumption. (In this case the use of 5 flaps rather than 10 is conservative for performance and uses less fuel).

Confirmation that the planned gross weight is within the operating limits of the airplane.

AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T

Take off Data Card

Equivalent temperature (maximum temperature at which take off is possible at the actual weight)

Handbook and gross weight manual for computing normal take off thrust.

Provide safe operation of the airplane with consideration for extending engine life by using reduced thrust.

90° E.T.

Thrust Limit Temp	
SL	106°F
2,000 ft	100°F
4,000 ft	94°F (90)
6,000 ft	88°F

DEN →

Performance Limit Temp

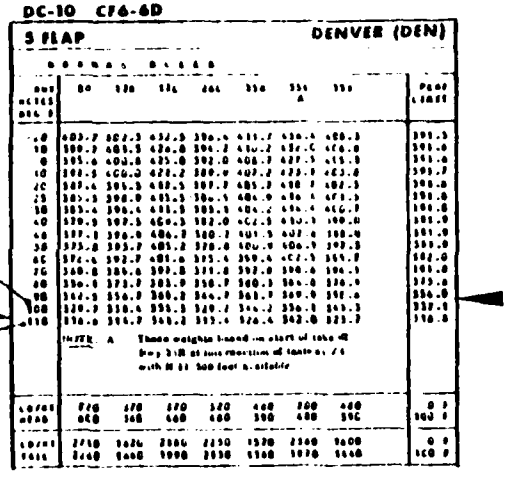
(Using actual takeoff wt in PERF LIMIT column, find max temp for climb)

Runway Limit Temp

(Using actual takeoff wt in RWY LIMIT column, find max temp for takeoff with zero wind)

DC-10 CF6-6D

5 FLAP DENVER (DEN)

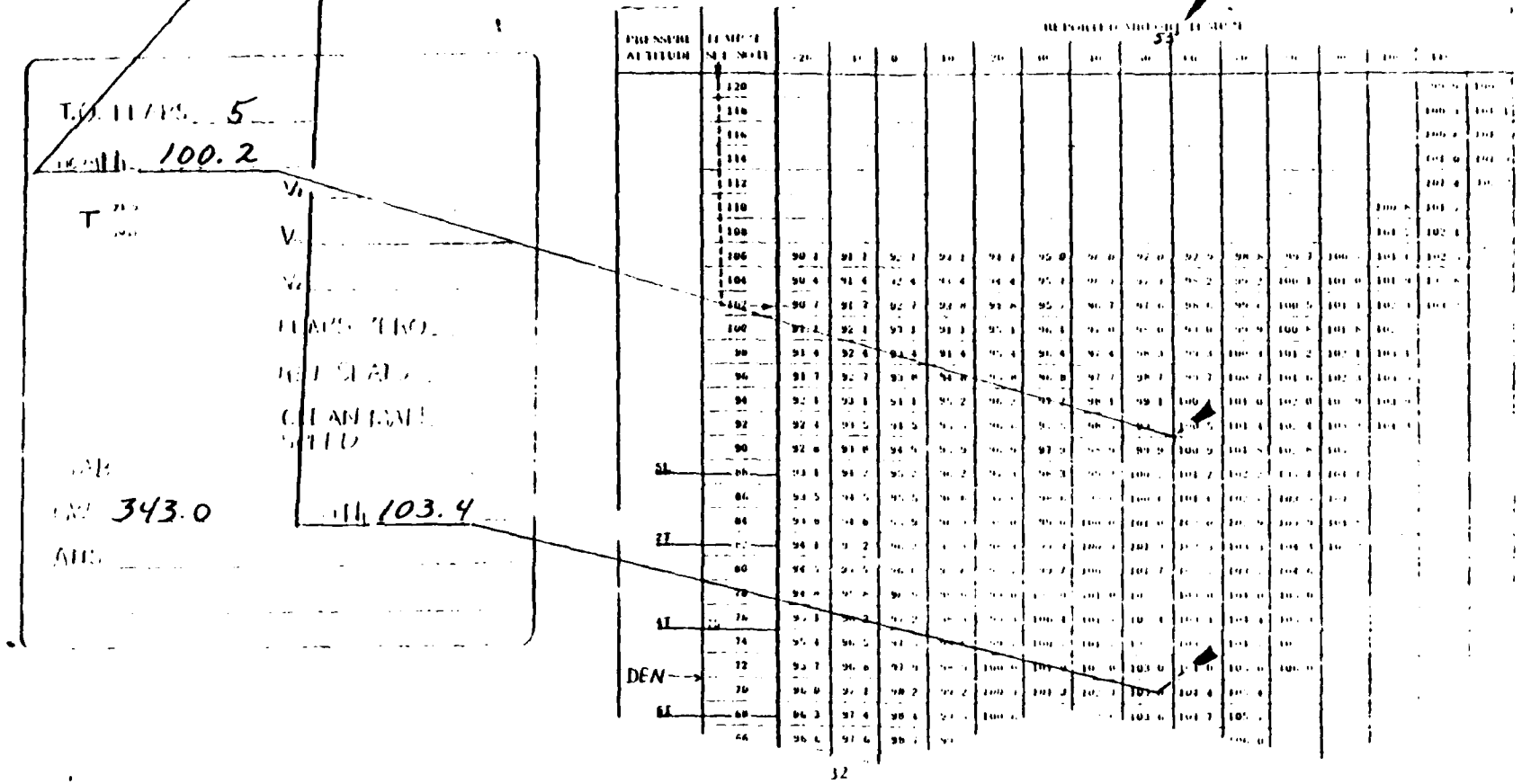


AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T

Take off Data Card
Normal and limit thrust

Handbook and equivalent temperature

for setting take off thrust



AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T

Take off Data Card
Speed computations

Handbook, pressure altitude, equivalent temperature, flap setting and gross weight.

Provide information to the crew relative to airplane performance and to provide a basis for go/no go decision by the Captain in the event of mechanical or other problems during take off and to provide safe operating speeds during climb out.

T.O. FLAPS 5

100.2

V_1 139

V_R 144

V_2 154

FLAPS ZERO 158

FLAP SPEED 189

CLEAN MANEUVER SPEED 204

343.0

103.4

33

TAKEOFF SPEEDS

PRESS ALT -1000 FT	TEMP (Use Equivalent temp for NORMAL MTOW) (Use reported airport temp for LIMIT MTOW)												PLAP ZERO SPEED	FLAT RETRACTION SPEED	CLEAN MANEUVER SPEED
6 to 7 (1)	°F - - -	°F - - -	°F -30 to 76	°F 71 to 87	°F 88 to 100										
5 to 6	°F - - -	°F - - -	°F -30 to 51	°F 52 to 87	°F 88 to 101	°F 102 to 115									
4 to 5	°F - - -	°F -30 to 76	°F 80 to 94	°F 95 to 107	°F 108 to 120										
3 to 4	°F -30 to -13	°F -13 to 86	°F 87 to 100	°F 101 to 113	°F 114 to 126										
2 to 3	°F -30 to 69	°F 50 to 86	°F 85 to 100	°F 101 to 118	°F - - -										
1 to 2	°F -30 to 87	°F 88 to 101	°F 102 to 115	°F 116 to 130	°F - - -										
BELOW 1															

FLAP POS	WEIGHT (1000 LBS)	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2			
5	400	150	163	173	159	165	172	168	165	173	166	167	173	168	168	172	176	213	223
	430	155	160	170	157	161	170	166	163	170	162	165	170	166	166	170	174	211	221
	420 V	153	156	166	156	159	168	157	161	169	159	163	169	163	164	168	172	208	219
	427	149	154	166	152	155	166	153	157	166	156	159	166	160	160	166	170	206	217
	400 M	147	152	165	148	153	165	151	155	165	153	157	165	157	158	165	168	203	215
	388 A	142	148	161	143	148	161	146	151	161	148	153	161	152	154	161	165	198	211
	3(3)																		
	360 C	137	143	157	138	144	157	141	146	157	143	148	157	147	149	157	161	193	207
	350	134	139	153	133	139	153	135	141	153	138	143	153	141	145	153	157	188	203
	330	126	133	148	127	135	148	130	136	148	132	138	148	136	140	149	153	179	199
	300	119	128	144	121	129	144	123	131	144	126	132	144	129	134	144	148	174	195
	280	113	121	139	114	123	139	117	126	139	119	126	139	123	127	139	144	170	191
	260	106	114	134	108	116	134	110	117	134	113	118	134	116	121	134	138	166	187
	V LIMITED	104	113	-	106	-	-	108	-	-	-	-	-	-	-	-	-	-	-
10	440	151	154	165	153	156	165	156	157	165	158	159	165	161	161	165	176	213	223
	430	149	152	163	151	154	163	153	155	163	156	157	163	159	159	163	174	211	221
	420 V	148	150	161	148	152	161	151	153	161	153	155	161	157	157	161	172	208	219
	410 M	143	146	160	144	148	160	147	149	160	150	151	160	153	[illegible]	160	170	206	217
	400 A	141	144			146	158	145	147	158	147	149	158	[illegible]				203	215
	380 B							140	143	154	142	145	[illegible]						
											137								

DATA	SOURCE	USAGE

AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T

Take off Data Card	Handbook	Engine out special procedures at certain airports
"T" Procedure (none at DEN)	Weight manifest (computed by UNIMATIC)	To compute the stabilizer trim setting
% of MAC (22.7%)	% MAC and flight handbook	Provide longitudinal stability for take off
Stabilizer trim setting		

T.O. FLAPS 5

NORM N_1 100.2

"T" YES / NO

V_1 139

V_R 144

V_2 154

FLAPS ZERO 158

RET SLATS 189

CLEAN MAN SPEED 204

STAB 4.0

GW 343.0 TMP N_1 103.4

ATIS Quebec 13:15 GMT 1900' @ 4000' @

VS Rain 53° Alt 30.07 Wind 020°/7K

Dept Rwy 35L + 35R Clr Del 127.6

TAKEOFF STABILIZER SETTING (NOSE UP)

FLAP POS	% MAC 22.7%					
	8	10	15	20	25	30
5	7-1/2	7	6	4-1/2	3-1/2	2
10	8	7-1/2	6-1/2	5	4	2-1/2

STAPLETON INTERNATIONAL AIRPORT DEPARTURE INFORMATION QUEBEC - ALL AIRCRAFT CONTACT CLEARANCE DELIVERY ON 127.6. 1315 GREENWICH WEATHER 1900' SCATTERED, 4000' OVERCAST, VISIBILITY 5 MILES IN LIGHT RAIN, TEMPERATURE 53, DEW POINT 46. WIND IS 020° AT 7 KNOTS, ALTIMETER 3007. DEPARTING RUNWAY 35 LEFT, RUNWAY 17 LEFT - 35 RIGHT CLOSED. UPON RECIEVING YOUR ATC CLEARANCE, READ BACK ONLY YOUR CALL SIGN AND TRANSPONDER CODE UNLESS YOU HAVE A QUESTION ABOUT THE CLEARANCE. ADVISE CLEARANCE DELIVERY WHEN READY TO TAXI THAT YOU HAVE INFORMATION QUEBEC.

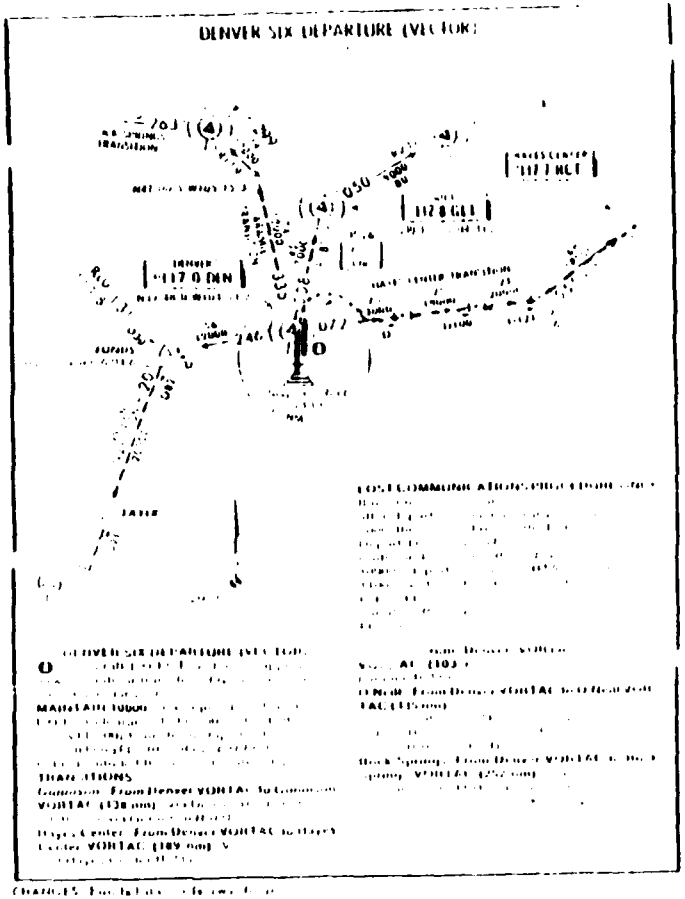
13:29:00	Automatic Terminal Information System	Provide wind, weather and airfield condition information to the crew for conduct of the takeoff and climb out.

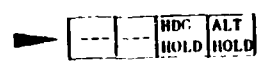
DATA		SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T			
13:12:00	Cabin crew briefing: Cockpit visits - only after interphone contact - not on the ground, unless holding.	Captain - introduces himself to the cabin First Flight Attendant - SOP	Prepare cabin crew for any expected unusual flight conditions.
	Weather conditions in flight: "Possible turbulence both during climb out and descent, smooth flight conditions on top of the clouds."	WBW - Captain	
	Taxi time will be short to rnwy 35L	Captain - NOTAMS	
	Cabin condition: Two wheel chairs in aft cabin	First Flight Attendant	Informs Captain of possible problems if an emergency evacuation should become necessary.
	Cockpit door signal - two raps	Capt - FFA	Identify cabin crew member wishing access to cockpit.
13:15:00	Entering cockpit - Log book & airplane condition.	Captain - F.O. - S.O.	Discuss any discrepancies in the log and anything discovered by the S.O. on the inspection.

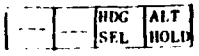
CAPT: "Matt, have you seen the log book and been around the outside?"

S.O.: "Yes, Captain George, the exterior looks okay and there are no write ups in the log book. The Second Officer on the inbound flight said every thing was all right. I've got the fuel sheet and weight manifest and it all looks ok."

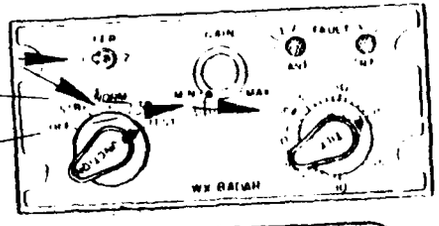
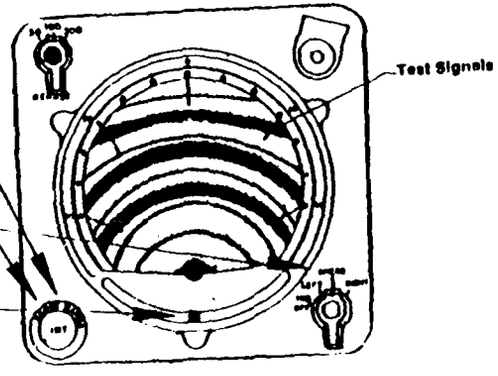
CAPT: "Thanks Matt, I've told the cabin crew to rap twice if they want to visit the cockpit."


DENVER SIX DEPARTURE (VECTOR)
DEN
117.0
050
240
270
290
310
330
350
370
390
410
430
450
470
490
510
530
550
570
590
610
630
650
670
690
710
730
750
770
790
810
830
850
870
890
910
930
950
970
990
1010
1030
1050

	DATA	SOURCE	USAGE
	AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
	Captain's cockpit preparation	Direct examination	Verify airworthiness and set instruments, radios, flight guidance system and navigation systems for flight.
13:15:40	Seat position	Alignment marks	For correct eye placement for best vision.
	Master warning and caution lights - out	SOP - Capt	Reset if on for future indications.
	Cockpit lights - adjusted	SOP - Capt	Set for individual preference.
	Sliding window - secured	SOP - Capt	Assure that window is latched.
	Oxygen mask & mic - test and set 100%	SOP - Capt	Assure proper fit and operation.
	Forward over head panel - checked	SOP - Capt	Confirm that the S. O. has completed his set up.
	HF radios - tuned and checked (if used)	SOP - Capt	Not used for this flight.
	Flight mode annunciators are shown here:	AUTO THROTTLE MODES / STEER MODES / ARMED MODES / PITCH MODES SPD | VOR ALT | HDG HOLD | VERT SPD	These annunciators remind the pilots of the modes of operation of the flight directors, auto pilot and auto throttles have been armed or are in use.
	Flight director switch - on	SOP - Capt	Prepare FCS for flight
	FCS annunciators show:		
	Auto throttles - blank		Auto throttles are off.
	Armed modes - blank		Nothing has been armed.
	Steer mode - Heading hold		Basic mode of engagement.
	Pitch mode - Altitude hold		Basic mode of engagement.
	VOR radio 1 - tuned - ILS 109.3		Test ILS radio and indicators.
	Test switch - up/left		HSI & ADI LOC & Glide slope inds show 1 dot up & left.
	Test switch - down/right		" " " " " " " 1 dot dn & tght
	VOR radio 1 - tuned - VOT 110.0		Test VOR NAV radio and indicators.
	OBE switch - normal		For navigation after take off.
	ADF/VOR selectors - normal		
	VOR radio 1 - tuned to 117.0 DEN VOR	DEN approach plate	To track the VOR radial after take off.
	#1 course selector - 022°	SOP - Capt	To track the VOR radial after take off.
	Auto throttles - off		Not for use on the ground.
	Auto throttle speed set - 124 kts	FOH page 164 SOP - Capt	Preselected first speed for after take off.
	Command speed bug on A/S ind - 124	DEN SID (see page 36) DEN SID " " " SOP - Capt T&R manual & take off data card (V2 + 70 kts)	Reminder for the pilot.
	Heading selector - Set airplane heading then turn right and left, heading bug on HSI should follow	 Automatic from Auto throttle speed selector SOP - Capt	Verify operation.

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Heading selector - set to *100°*	*DEN SID departure path.*	First anticipated heading after departure to intercept the out bound radial.
		
Static air selector - normal	SOP - Capt	Assures correct airspeed and altitude information.
Clock - set	SOP - compare with GMT on ACARS - Capt	*Accurate time* for position reporting.
Mach/airspeed ind - normal & airspeed bugs set, V1 - 139, V2 154 & ret. slats - 189.	Take off data card - Capt	Safe speeds for control and go/no go decisions in case of engine or other failures during take off, and for flap and slat retraction during climb out.
FGS mode annunciators - test	SOP - Capt	Test confirms annunciator operation and realigns the system if it should be necessary.
		
ADI - test Bank - 20° right Pitch - 10° nose up Steer command bar fly right Pitch command bar - fly up Runway symbol - 100 feet FD, ATT & RWY warn flags - appear	SOP - Capt	Verify operating condition of the horizon indicator and flight director indicators.
Radio altimeter - test Altitude ind - 40' Flag appears DH warn light - on when test button released.	SOP - Capt	Assure altitude alerts descending through 2,500' and approaching minimums during low approaches.
Altimeter - set to 30.07	ATIS - Capt	*Accurate altitude information during flight.*
Marker beacon lights - test	SOP - Capt	Assure position info during low approaches.
Radio/INS selector - radio	SOP - Capt	Radio navigation to be used after take off.
RMI & course indicators - checked	SOP - Capt	Verify showing correct information.

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Captain's cockpit prep con't		
Center instrument panel:		
Standby instruments:		
Attitude indicator - cage	SOP - Capt	Assure the instrument is operable and erect.
Altimeter - set 30.07	ATIS - Capt	Assure correct information.
Airspeed indicator - check	SOP - Capt	Verify airworthiness.
Center instrument panel:		
N1 gages limit bugs - match the thrust limit comp.	SOP - Capt	Assure that engine N1 limit RPM will not be exceeded.
N1 gage max limit pointer - on the red line	SOP - Capt	Verify engine N1 RPM was not exceeded on prev. flight.
EGT gage - ambient temp & Max pntr on the red line	SOP - Capt	Verify gage indicates properly and that the limit has not been exceeded.
N2 gages max limit pointers - on the red line	SOP - Capt	Verify limit has not been exceeded.
Take off warning horn test:		
Spoilers - retracted	SOP - Capt	Retracted for the test.
Stabilizer trim - green band	SOP - Capt	In the take off range for the test.
Parking brake - released	SOP - Capt	Released for the test.
Flap/slats up/retract	SOP - Capt	This selection required for the test.
Throttle # 1 or 2 - advance	SOP - Capt	Will cause take off warning horn to sound.
Take off warning horn - sounds	Aural - Capt	Spoiler, trim and flaps are positioned properly for flight, while the slats are not. This tests the horn and proves that the slats will cause the warning to sound.
NOTE: Be certain there is sufficient hydraulic pressure for brakes and that the pedals are depressed while the test is being done to prevent unwanted movement.		

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
13:20:00 Weather radar:		Prepare for test and adjustment.
Warm up (5 minutes - S.O. 13:02)	Additional procedure - Capt	
Function selector - test TFR (transfer) sw - 1 Tilt control - full up Gain control - auto		
Range mark controls (both scopes - full CCW Intensity (both) - full CCW Range - 1 ind, 100, the other, 300. Offset sw. - 1 ind, ahead, the other, lt or rt. Filter sel - (both) - full bright Vertical gyro sel. - normal		
Adjustment Intensity and range marks - set Filter selector - set	Additional procedure - Capt & F.O.	To present most clarity To provide best light level

	DATA	SOURCE	USAGE
	AIRPLANE CONDITION- PREPARATION FOR FLIGHT CON'T		
	Park brake - set	SOP	Safety of ground crew and equipment during start
	Throttle quadrant - check	SOP	Assure proper position of controls for engine start
	FCS set for take off mode	Selector on #2 throttle --- --- TAKE OFF TAKE OFF	Pitch command bar will now provide speed guidance to maintain V2 + 10 kts, and steer command bar will command runway heading after take off.
	Pedestal - check, and tune VHF communication radio to clearance delivery, 127.6	SOP, ATIS and FOM airport plate	Verify position of controls and set radio to receive the ATC clearance.
13:21:00	INS present position - load:	SOP - Capt and First Officer	Present position must be loaded in INS if it is to be used for navigation.
	INS CDU 1 data sel - position.	Captain	Preparation for loading data.
	Denver gate Lat & Long - load	FOM or gate position card	First Officer reads - Captain keys in the data.
	F.O.: "North 39°45.7'"		CAPT: "North 39°45.7' - confirm?"
	"Confirmed."		"Roger, inserting."
	"West 104°53.3'"		"West 104°53.3' - confirm?"
	"Confirmed."		"Roger, inserting."
	INS CDU 2 data sel - position.	First Officer	Preparation for loading data.
	Denver gate Lat & Long - load	FOM or gate position card	Captain reads - First Officer keys in the data.
	CAPT: "North 39°45.7'"		F.O.: "North 39°45.7' - confirm?"
	"Confirmed."		"Roger, inserting."
	"West 104°53.3'"		"West 104°53.3' - confirm?"
	"Confirmed."		"Roger, inserting."
	Performance index 5 - confirm	SOP, flight handbook - Capt & F.O.	Minimum acceptable index for accurate navigation
	Waypoints 1 & 9 load Lat & Long	SOP - Captain and First Officer	Provides distance and time to destination, and capability to navigate to destination or back to departure point at any time.
	INS CDU - select remote on 1 & 2	Capt & F.O.	Permits dat to be inserted in both INS's, using one keyboard.
	INS CDU - select waypt on 1 & 2	Capt & F.O.	Preparation for entering data.

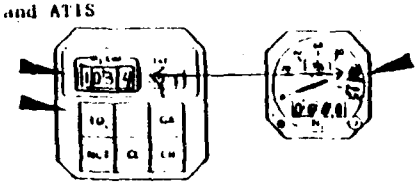
DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Waypt selector - 1 (both INS's)	Capt - F.O.	
Load Lat & Long - Denver gate:	FOM or gate position card	Capt reads - First Officer keys in data.
CAPT: "North 39°45.7'"		F.O.: "North 39°45.7' - confirmed?"
"Confirmed."		"Roger, inserting."
"West 104°53.3'"		"West 104°51.3' - confirmed?"
"Confirmed."		"Roger, inserting."
Waypt selector - 2 (both INS's)		
Load Lat & Long - Chicago gate		
CAPT: "North 41°58.5'"		F.O.: " North 41°58.5' - confirmed?"
"Confirmed."		"Roger, inserting."
"West 87°54.4'"		"West 87°54.4' - confirmed?"
"Confirmed."		"Roger, inserting."
13:22:00 INS mode selector - NAV (when performance index 5 - green lt on)	SOP - Capt & F.O.	The airplane must not be moved until the mode selector has been placed to NAV. Provide economical safe setting.
13:25:40 Flap setting selection - 5	Capt. & S.O. - handbook	
First Officer's Cockpit Preparation	Direct Examination	As discussed for the Captain except as follows.
Stall warning - test: Test sw lt, then rt, the control column should vibrate after 5 sec. each way	SOP, flight handbook	Verify airworthiness
Speed warning - test: Test for 'clacker' in pos. 1 and 2		
Speed control - test: Fast/slo indicators show half scale deflection in direction of test.		
Windshield anti-ice and de-fog normal/ on	SOP	Assure visibility during flight

UNITED AIRLINES

RAMP POSITION COORDINATES FOR INERTIAL NAVIGATION SYSTEM (INS) AND FLIGHT MANAGEMENT SYSTEM (FMS) OPERATIONS
(Mainland Airports)

AIRPORT	AREA	COORDINATES	
[illegible]	All UAL Gates	N 41° 58.0'	W 87° 53.7'
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	N 39° [illegible]	W 104° [illegible]
DEN	All UAL Gates	N 39° 45.7'	W 104° 53.3'
[illegible]	All UAL Gate	N 41° 32 0'	W 87° 39 0'
[illegible]	[illegible]	N 3[illegible]	W 117 [illegible]
ORD	All UAL Gates	N 41° 58.5'	W 87° 54.4'

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
First Officer's cockpit prep		
Engine anti-ice switches and disagree lights off	SOP	System should be off for engine start
No smoking sw. - on, and seat belt switch - off	SOP	Safety consideration on the ground
TAS/SAT - check, no flags	SOP	Verify operable condition
TAT and SAT read approx 53°	SOP and ATIS	Thrust computer thrust limit depends on an accurate temperature reading
Thrust computer take off mode selected.	SOP	Positions the thrust limit bugs on the N1 gages to indicate maximum thrust setting to the pilots.
Speed brake and slat reset lts off.	SOP	Proper position of speed brakes and slats. (slat reset light on requires maintenance action)
Flap, slat and surface position indicators check/normal	SOP	Proper position of flight controls.
Ground proximity warning system - test; warning lights and aural warnings come on	SOP	verify proper operation of the system for safety
13:28:00 ATC Clearance:	VHF #1 Denver clearance delivery (127.6)	First Officer notifies Captain that clearance is to be received so that he can monitor.



F.O.: "Denver Clearance delivery, United Heavy two eighty, gate 22 ready for clearance."

DEN CPT: "United Hvy two eighty, cleared to Chicago as filed, Denver 6 departure, Hayes Center. Call Denver departure Control on 128.05. Squawk 4872. Contact ground on 121.9 when ready to taxi."

F.O.: "Roger, cleared as filed United two eighty."

Flap take off selector - 5	Take off data card	Assure correct flap setting for conditions.

	DATA	SOURCE	USAGE
	AIRPLANE CONDITON - PREPARATION FOR FLIGHT CON'T		
	First Officer's cockpit prep:		
	Transponder set to standby and code 4832, mode A, altitude reporting and alt. source 1.	SOP ATC clearance SOP	First Officer confirms code 4832 with the Captain and sets it in the transponder, to provide ground radar stations with airplane identification, location and altitude, for flight following & control.
	Marker selector to LO	Sop	Set for flight
	(NOTE: The items listed for the F/O above are in addition to all cockpit items performed by the Captain for his flight instruments.)		
	Full crew before start procedures:		
13:29:15	VHF radio - tuned to 129.5 Possible delays	SOP, FOM (for freq.) United ramp planner	For contact with the United ramp planner First Officer calls 5 minutes prior to departure.
	F.O.: "United Ramp, United Heavy two eighty for delay info."		
	Ramp: "Two eighty, no delays. Have a good trip."		
	Seat belt signs on	SOP, Captain turns on signs, activates the P.A.	Captain alerts the F/A's to insure passengers are seated for engine start and pushback.
	CAPT: "Flight Attendants prepare for departure."		
13:29:30	BEFORE START CHECKLIST	Checklist card	Called for by the Captain and read as a challenge by the First Officer. Response by the appropriate crew member, as follows:

CHALLENGE)F/O)		RESPONSE
SLIDING WINDOWS	-	ROLLER FORWARD, HANDLE LATCHED (C, F/O)
PARKING BRAKE	-	SET, PRESSURE NORMAL (C)
OXYGEN	-	CHECKED (C, F/O, S/O)
YAW DAMPERS	-	ON (C)
INS	-	2 ON NAV (C)
CABIN SIGNS	-	ON (C)
WINDSHIELD ANTI-ICE/DEFOG	-	NORMAL/ON (C)
THRUST COMPUTER	-	T/O SET (C)
RADIOS, CLOCKS & ALTIMETERS	-	SET (C, F/O, S/O)
FLAP T/O SELECTOR	-	5 SET (C)
FUEL LEVERS	-	OFF (C)
BATTERY SWITCH	-	BAT, LOCKED (S/O)
HYDRAULIC QUANTITY	-	NORMAL (S/O)
FUEL	-	53,700 LBS., CLEARED WITH 52,600 LBS. (S/O)
FUEL X-FEEDS	-	CLOSED (S/O)
OIL QUANTITY	-	NORMAL (S/O)

13:31:00		F/O: "Checklist complete"

DATA	SOURCE	USAGE
AIRPLANE CONDITION - PREPARATION FOR FLIGHT CON'T		
Full crew before start procedures: (con't)		
First Flight Attendant's report:	First F/A	FF/A reports to the Captain to insure that the cabin is secured and it is safe to operate.
Preflight safety inspection complete	Direct examination	
Passenger count - F 20 R 151 F/A 6	Physical count	
One F/A to be in the lower galley during taxi.		
Cargo door annunciator lights	Direct examination	Second Officer tests and insures that the doors are closed and lights out, for safety of flight.
Cockpit door closed (locked)	SOP, FOM & flight handbook	Second Officer closes the automatically locked door, for security and 'sterile cockpit'.
13:31:00 ENGINE STARTING - PUSH BACK		
Push back clearance (VHF 129.5)	United Ramp Planner	Assure area behind airplane is not obstructed.
F.O.: "United ramp, united heavy two eighty, we are ready to push."		
RAMP: "Roger United two eighty, clear to push."		
Push back & start clearance	Ground mechanic on interphone	Contact ground mechanic for engine start clearance and push back.
CAPT: "Ground, United two eighty we are ready to push and start engines."		
MECH: " Brakes off, anti/skid off clear to start all engines."		
CAPT: "Roger, brakes off - anti/skid off"		
13:34:00 Push back & start - begin:		
Anti collision light - on	SOP - First Officer	To alert ground traffic that engines are starting and area behind will be subjected to jet blast. Prepare to start engines.
Engine ignition selector to start "B"	SOP - First Officer - handbook (B for even numbered flights)	
APU N1 RPM - 97%	Automatic as ignit. is selected to start	Provides additional pneumatic air for engine start
13:34 + Out time, airplane number, fuel on board & fuel boarded.	ACARS memory	Automatically transmitted thru ARINC to DAL Unimatic when brakes are released after passenger entry door is closed.

	DATA	SOURCE	USAGE
	ENGINE STARTING - PUSHBACK CON'T		
	Start procedures con't		
	Aft fuel pumps on - press normal, press lo lts on, then off	SOP - Second Officer	Provide fuel pressure for engine operation
	Pack sws - all off	SOP - Second Officer	Conserve pneumatic pressure for engine start
	Pneumatic pressure - 30 PSI desired (may be as low as 25)	Handbook - limitations section	Avoid overtemping the engine during start
13:34:15	Start preparations complete	Second Officer	Assure proper configuration of controls and systems
	S.O.: "Ready to start, pressure 34 PSI."		
	CAPT: "Start number Three."		
13:34:30	Engine 3 start sw in, lt on (switch holds in magnetically)	First Officer	Opens pneu starter valve to turn the engine
	#3 N2 RPM increases	Engine inst panel - Capt and F.O.	Monitor engine start
	Pneumatic pressure	S.O.'s panel - S.O.	Verify sufficient pressure for satisfactory start
	#3 N2 RPM 15% - fuel lever - on	SOP - Capt	Provide ignition and fuel to the engine for start
	Fuel flow - indicates	Instrument - Capt, F.O.	Monitor start
	EGT - indicates rise within 25sec	SOP - instrument - Capt, F.O.	Monitor Start
	Oil press - rise to 10 PSI + by 45% N2 RPM	SOP - instrument - handbook limit sect. S.O.	Monitor start, assure sufficient oil press
	Starter button out, lt out by 45% N2 RPM	Automatic - F.O.	verification that starter valve is closed
	N1 RPM - appr 20%, N2 appr 60%	Instruments - Capt, F.O.	Verify normal engine idle speed
	EGT - normal range	Instrument - Capt, F.O.	Verify normal engine operation.
	1-3 isolation valve closed	SOP - S.O.	Isolate number three pneumatic system from one and two so that number three engine pneumatics can be used for air conditioning the cabin (pax comfort)
13:35:40	Number 3 eng bleed and number 3 pack - on and auto	SOP - S.O.	Establish cabin air conditioning
	Number 3 generator - off lt off, load normal and APU #3 in use lt - out	SOP - S.O.	Verify number three generator operating normally and powering its bus.
	S.O.: "Captain, I'm ready for disconnect."		

DATA	SOURCE		USAGE
ENGINE STARTING - PUSHBACK CON'T			
Start procedure con't			
13:35:45 Pushback complete: Brakes set		Mech - Capt	Assures safety during disconnect procedures.
	MECH:	"Set brakes."	
	CAPT:	"Ready to disconnect."	
	MECH:	"Disconnecting - watch for salute."	
Salute		Mech	Disconnect complete, area around airplane is clear.
Taxi lights - on/off		Captain	Acknowledge salute
Direction indication		Mech - hand signal	Indicates direction of taxi.
Engine 1 - start			
	CAPT:	"Start number one."	
13:36:00 Start procedure		SOP	Steps are the same as for number 1.
VHF radio - tuned to 121.9		FOM (for freq) - F.O.	For taxi clearance.
13:36:30 Taxi clearance		Denver ground	Rec'd by F.O. - monitored by Capt
	F.O.:	"Denver ground, united heavy, two eighty is ready for taxi."	
	DEN GRND:	"Cleared to runway 35L. Contact Denver tower on 119.5 when ready for take off."	
13:37:00	F.O.:	"Roger, cleared to taxi to 35L."	
AFTER START AND TAXI OUT			
13:37:15 Begin taxiing:			
Parking brake - off and throttles advance.		Capt	Start to taxi
Engine 2 - start			
	CAPT:	"Start number two."	
13:37:05 Start procedure		SOP - Second Officer starts eng 2	Start by S.O., performing all steps as in engines 3 and 1 above, relieves the Capt and F.O. to perform taxi and after eng start SOP's
13:37:55			

DATA	SOURCE	USAGE
ENGINE STARTING - PUSHBACK CON'T		
Start procedure con't		
13:35:45 Pushback complete: Brakes set	Mech - Capt	Assures safety during disconnect procedures.
	MECH: "Set brakes."	
	CAPT: "Ready to disconnect."	
	MECH: "Disconnecting - watch for salute."	
		Disconnect complete, area around airplane is clear.
Salute	Mech	Acknowledge salute
Taxi lights - on/off	Captain	Indicates direction of taxi.
Direction indication	Mech - hand signal	
Engine 1 - start		
	CAPT: "Start number one."	
13:36:00 Start procedure	SOP	Steps are the same as for number 3.
VHF radio - tuned to 121.9	FOM (for freq) - F.O.	For taxi clearance.
13:36:30 Taxi clearance	Denver ground	Rec'd by F.O. - monitored by Capt
	F.O.: "Denver ground, united heavy, two eighty is ready for taxi."	
	DEN GRND: "Cleared to runway 35L. Contact Denver tower on 119.5 when ready for take off."	
13:37:00	F.O.: "Roger, cleared to taxi to 35L."	
AFTER START AND TAXI OUT		
13:37:15 Begin taxiing: Parking brake - off and throttles advance.	Capt	Start to taxi
Engine 2 - start		
	CAPT: "Start number two."	
13:37:05 Start procedure	SOP - Second Officer starts eng 2	Start by S.O., performing all steps as in engines 3 and 1 above, relieves the Capt and F.O. to perform taxi and after eng start SOP's
13:37:55		

DATA	SOURCE	USAGE
AFTER START AND TAXI OUT DON'T		
13:38:30 Weight manifest check request	SOP - S.O.	Determine if there have been last minute changes in the weight and balance data.

ACARS data mode - select
Data key lights

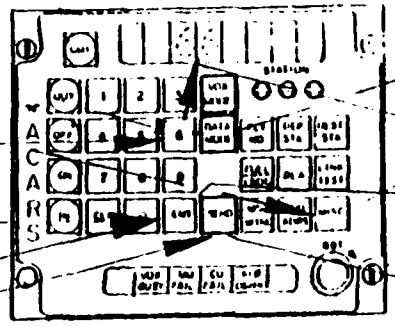
MISC key - select
Misc key lights

6 key press twice
Data display shows 66

ENT key - press
Data display shows all 8's

ENT key - press
Data display goes blank

SEND key - press
Send key lights



Indicates ACARS set is ready to accept coded message.

Indicates ACARS set is ready for code to be keyed in.

Confirm correct code keyed in.

Enter code in ACARS memory.

ACARS ready to send.

Request is sent.

13:39:15 Weight manifest check received

MESSAGE WAITING key - flashing

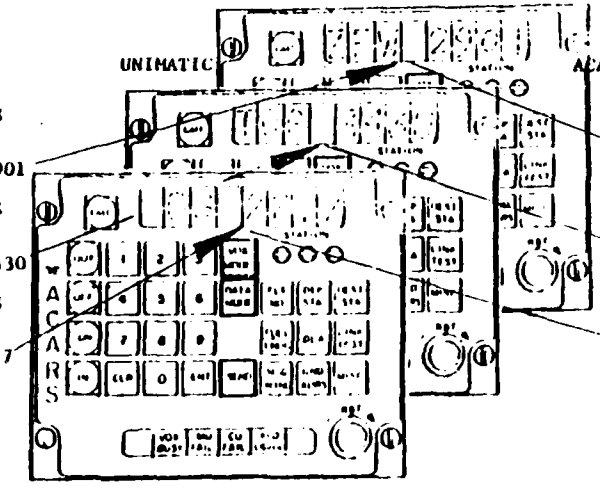
MESSAGE WAITING key - press
Data display shows ZFW 2901

MESSAGE WAITING key - flashing

MESSAGE WAITING key - press
Data display shows TOG 3430

MESSAGE WAITING key - flashing

MESSAGE WAITING key - press
Data display shows CG 22.7



Determine final weight and balance information.

Uplink message ready to read.

Confirm final zero fuel weight.

Uplink message ready to read.

Confirm final gross takeoff weight.

Uplink message ready to read.

Confirm final CG.

	DATA	SOURCE	USAGE
	AFTER START AND TAXI OUT CON'T		
13:39:00	After start SOP's		
	Ignition - off	SOP - F.O.	Save wear on the igniters when not needed.
	Exterior lights - off, except rotating beacon.	SOP - F.O.	Daylight operation - lights off except beacon, to indicate engines running or airplane moving.
	Engine anti ice - off	SOP - Capt & F.O.	Off as no anti icing required.
	Hydraulic system - check	SOP - S.O.	Verify proper operation, quantity and temp normal.
	Quantity bugs - set to indicated quantity.	SOP - S.O.	To monitor for quantity loss in flight.
	Rudder standby - arm	SOP - S.O.	Provide alternate rudder power in case of hyd. failure.
	1-3 & 2-3 motor pumps - arm	SOP - S.O.	Provide back up hydraulic power in case of failure.
	Electrical system - check	SOP - S.O.	Verify normal operation.
	CSD - temp and press	Temp gage - press low lights - S.O.	
	AC bus tie isolate lights - 1 & 2 on, 3 out	SOP - S.O.	Number three generator powering the tie bus.
	Parallel generator button - press	SOP - S.O.	To parallel generators to equalize loads and provide back up electrical power in case of failure.
	1 & 2 isolate lights - out	SOP - S.O.	Indicates parallel condition.
	Electrical system annunciator lights - out.	SOP - S.O.	Verify normal operation.
	Volt/amp/freq selector - Bat & left emer. bus	SOP - S.O.	To monitor electrical power.
	Galley power - on	SOP - S.O.	Provide power to operate the galley.
	Fuel system - set	SOP - S.O.	Assure fuel supply to each engine and monitor fuel consumption.
	Annunciator lights - out		
	quantity gages - equal		
	Fill valves - closed		
	X-feed valves - closed		
	pressure gages - normal		
	Fuel used indicators - increasing.		
13:39:30	Weight manifest check - received	S.O. - Capt	Confirm take off data card and make any last minute changes.
	S.O.: "Captain there are no changes to the take off data card."		
13:39:40	CAPT: "Thanks Matt."		

DATA	SOURCE	CAT
AFTER START AND TAXI OUT CON'T		
After start SOP's con't:		
APU isolation valve closed	SOP - S.O.	Isolate the three pneumatic systems and unload the APU for shut down.
Engine bleeds - normal, pneu temperature and press - normal	SOP - S.O.	Provide air for the pneumatic and air conditioning systems.
Pack switches - auto	SOP - S.O.	Provide air conditioning for pax comfort.
Flow indicators - normal and Pack off lights - out	SOP - S.O.	Verify proper operation of packs.
Engine oil quantity - checked, quantity bugs - set.	SOP - S.O.	Bugs will reflect any change in indicated quantity.
Annunciator lights - normal.	SOP - F.O. & S.O.	Verify normal system operation.
Galley door light - out	SOP - S.O.	Galley doors must be closed in flight to preserve the "D" classification of the forward cargo comp.
Engine instruments - checked	SOP - Capt, F.O. & S.O.	Verify normal operation of the engines.
13:39:45 Taxi out procedures:		
Slat reset light - check off	SOP - F.O.	Assure slats will retract after take off.
Flap handle - 5	SOP - F.O. - take off data card	Set flaps to position indicated.
Flap tapes - 5, slat pos take/ off light - on and flap disagree flags not visible	SOP - F.O.	Verify flaps and slats are properly positioned for take off.
Pitot heat selector - set to "capt"	SOP - F.O.	Assure airspeed indicators operable after take off in case of icing conditions.
Air speed bug settings - check	SOP - Capt and F.O.	Confirm against take off data card.
Stabilizer trim - set to 4	SOP - Capt - take off data card	Assure airplane is in trim for stable pitch control after take off.
INS CDU - track/gnd spd	SOP - Capt and F.O.	Monitor ground speed during taxi and verify proper operation of INS.
Flight control check:		
Control wheel full left, then full right, wing and spoiler indicators show lt. then rt.	SOP - F.O.	Verify ailerons and spoilers move through full range and in the proper direction.
Control column full fwd, then full aft, elevator position indicators show full dn, then full up.	SOP - F.O.	Verify elevators move through full range in proper direction.

DATA	SOURCE	REMARKS
AFTER START AND TAXI OUT CON'T		
	Rudders and rudder indicators full lt and rt. (nose steering wheel must be held for dir. control)	SOP - Capt	Verify rudders move through full range in the proper direction.
	Flight instruments operate normally in turns.	SOP - Capt and F.O.	Verify instrument operation and FCS set as desired.
	NAV radios - set	SOP - Capt and F.O.	Recheck to verify, correct frequencies, courses and indicators set as desired for navigation.
	FCS altitude selector - check that 10,000' is set	SOP - SID - F.O.	Confirm that clearance *altitude is set for alt.alert.*
	FCS altitude selector - pull out.	SOP - F.O.	Arm the FCS to automatically capture the cleared alt.
	FCS annunciators - "BLANK, ALT, T/O, T/O."	SOP - F.O.	*Verify that the Flight Guidance System* is set for take off and initial climb to the cleared altitude.
	APU shutdown:		
	APU isolation valve - closed.	SOP - S.O.	APU will not shut down unless *this valve* has been closed for at least 90 seconds.
	APU gen. bus sws 1,2&3 - off.	SOP - S.O.	Assure APU is unloaded. Switches could cause electrical failure if left on.
	APU master switch - off.	SOP - S.O.	APU shutdown.
	Generator freq - check (420 Hz, or below, with N1 above 60%)	SOP - S.O.	*Verify Constant Speed Drive* is operating properly to prevent loss of all generators as engines come up speed for take off.
	All systems - monitor	SOP - S.O.	Continuously monitored to assure proper operation in flight.
	Spoilers - arm	SOP - F.O.	Provides automatic spoiler extension to aid in stopping in the *event of* an abort for engine or other failure during take off.
	Ignition - continuous B (A for odd numbered flights, B for even)	SOP - F.O.	Provide continuous ignition to prevent possible engine failure during take off.
	Anti-skid - armed	SOP - F.O.	Provide anti-skid braking in case of aborted take off (Anti skid is left off until away from obstructions during taxi out to avoid brake failure.)
13:40:15	Cabin Call chime sounds	First Flight Attendant	Reporting galley no longer occupied. Second Officer answers on the handset and relays to the Captain.

AFTER START AND TAXI OUT CON'T

13:40:50 BEFORE TAKE OFF CHECKLIST — Checklist card — Called for by the Captain and read as a challenge by the Second Officer. Response by the appropriate crew member, as follows:

CHALLENGE (S/O)		RESPONSE
APU ISOLATION VALVE	-	CLOSED (S/O)
TANK PUMPS	-	ALL AFT PUMPS ON (S/O)
MOTOR PUMPS & RUDDER STANDBY POWER	-	ARMED (S/O)
PITOT HEAT	-	ON (F/O)
ENGINE ANTI-ICE	-	ON/OFF(R/O)
IGNITION	-	CONTINUOUS (F/O)
ANTISKID	-	ARM (F/O)
ALTITUDE	-	10,000' SET (F/O)
FLIGHT & NAV INSTRUMENTS	-	CHECKED,SET (C,F/O)
FLAPS	-	TAPES 5 , TAKEOFF LIGHT, DETENT (F/O)
V SPEEDS	-	SET (C,F/O)
CONTROLS	-	CHECKED (F/O)
TRIM	-	3 SET (F/O)
FUEL LEVERS	-	ON,DETENT (F/O)
SPOILERS	-	ARMED (F/O)
SEAT POWER	-	OFF (C,F/O,S/O)
APU	-	OFF/ON (S/O)
ANNUNCIATOR LIGHTS	-	CHECKED (C,F/O,S/O)

13:41:50 Checklist held at this point until clear for take off. — S/O "checklist complete down to the line."

VHF radio - tuned to 119.5 — Freq from FOM and Denver ground taxi clearance — To request take off clearance.

F.O.: "Denver tower United heavy two eighty is ready for take off."

Denver tower: "Roger United two eighty, cleared into position, 35 right, cleared for take-off. Wind is 20° at 7 knots.

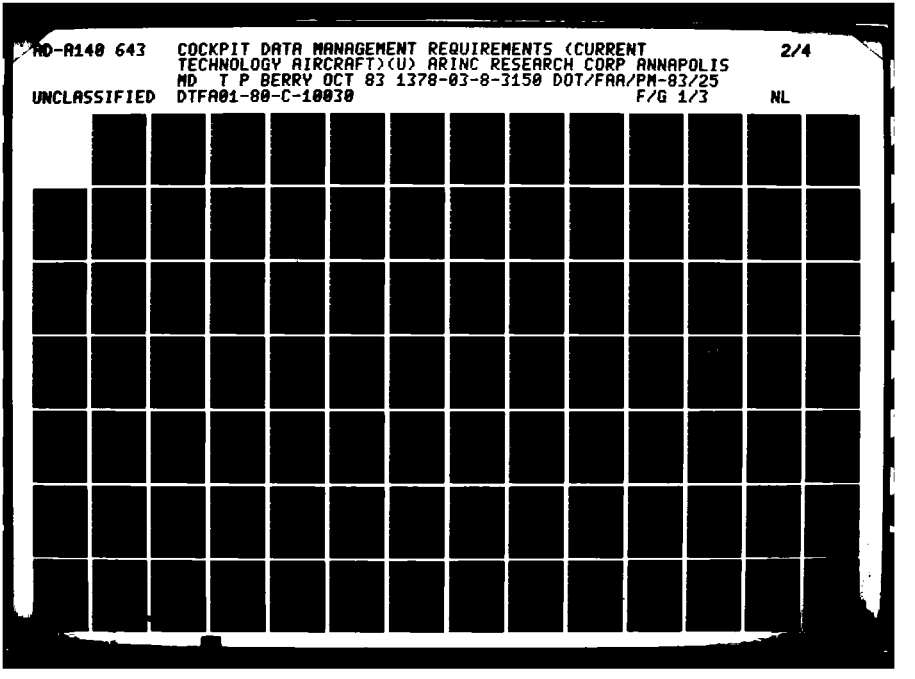
13:42:00 F.O.: "Roger, two eighty cleared for take off.

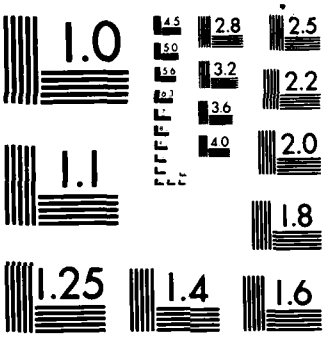
Checklist final items — SOP — Called for by the Capt and read by the Second Officer.

TRANSPONDER - ON (C,F/O)

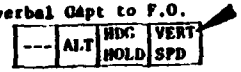
S/O "CHECKLIST COMPLETE."

	AFTER START AND TAXI OUT CON'T		
	Cabin announcement	SOP - Capt/S.O.	Alert cabin crew and passengers that the flight is about to take off.
	S.O.: "Ladies and Gentlemen, this is your S.O., we have been cleared for take off and will be departing momentarily. Flight Attendants please prepare for take off.		
13:42:15	Runway turn off lts - on	SOP - Capt	Makes the airplane more visible to other traffic. (Landing lights or turn off lights are required to be on for visibility up to 18,000'.)
	TAKE OFF		
13:42:20	Throttles - set to 100.2%, N1 (N1 RPM is the primary thrust indicator on the DC-10)	Normal thrust setting from the take off data card.	Captain uses the normal take off N1 setting from the data card when conditions permit, to reduce engine temperature and wear. (normal must not be lower than 3.5% less than limit thrust, 99.9% in this case.)
	Throttles - fine adjust	Data card	Second officer adjusts throttles, if necessary.
	Engine instrument limit marks - observe. (N1 will be expected to decrease up to 2% as speed increases.)	Visual - Capt, F.O. & S.O.	Verify correct thrust setting and preclude exceeding any engine RPM or temperature limits.
	Airspeed - V1 (139 kts)	Data card - monitored by F.O.	Decision speed - beyond this point flight is committed to flight. First Officer announces V1 aloud.
	F.O.: "V1."		
13:43:00	Airspeed - VR (144 kts)	Data card - monitored by F.O.	*Rotation speed* - Captain rotates at this point. First Officer also announces this speed.
	F.O.: "Rotate."		
	Pitch attitude - approx. 15°	SOP - training and reference manual	This attitude will produce approximately V2 speed for safe climb.
	Flight director command bars:		
	Pitch - center on airplane symbol	SOP - Capt	*Centering* the pitch command bar maintains V2 + 10 kts or V2 if an engine fails.
	Steer - Center	SOP - Capt	Centering steer command bar maintains the heading of airplane existing at lift off. (runway heading 050°)
	Fast/slow indicators - center	SOP - Capt	Indicators display deviation from the V2 + 10 kts *speed cor* nded by the pitch bar.
	OFF time	ACARS	Automatically transmitted through ARINC to PAL Delmatic after nose gear strut extended (lift off).


AD-A140 643
COCKPIT DATA MANAGEMENT REQUIREMENTS (CURRENT TECHNOLOGY AIRCRAFT)(U) ARINC RESEARCH CORP ANNAPOLIS MD T P BERRY OCT 83 1378-03-8-3150 DOT/FAA/PM-83/25
2/4
UNCLASSIFIED
DTFA01-80-C-10030
F/G 1/3
NL



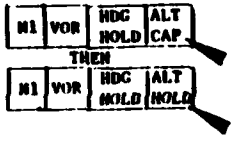
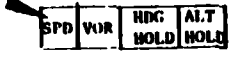
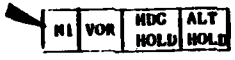
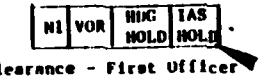
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

DATA	SOURCE	USAGE
TAKE OFF CON'T		
Vertical speed indicator, after an initial down indication - up	Air data computer	Displays positive climb indication and then the airplane vertical speed.
13:43:05 Landing gear - retract	SOP - Capt - F.O.	At positive climb indication, announced by the First Officer, the Captain commands Gear up. First Officer retracts the gear.
F.O.: "Positive rate."		
CAPT: "Gear up."		
13:43:10 Gear handle - up	First Officer	To retract the gear.
Gear indicator lts - from green to red to out.	Indicating system - First Officer	Verify gear has retracted.
Gear handle - to the blue dot position (neutral), for 5 to 10 seconds, then back to up. (prior to exceeding 230 kts)	SOP - First Officer	Verify that the gear doors have latched closed and will support the gear in case of hydraulic failure of system 3 which normally keeps the gear retracted.
Thrust computer climb mode - select	SOP - First officer	To ascertain the climb thrust setting and prepare for automatic throttle operation. Begin acceleration and flap/slat retraction
13:43:30 Altitude - 1,000' above ground level (approx 6330')	Altimeter - air data computer - Capt	
Vertical speed wheel - 1,000'/min up.	SOP - verbal Capt to F.O. 	Changes pitch command bar of the flight director from the take off mode to the vertical speed mode so that centering the bar now maintains 1,000'/min. The Steer mode also changes to heading hold.
CAPT: "Vertical speed 1,000."		
Airspeed - 158 kts (flap retract spd)	Air data computer - airspeed ind. - Capt	Safe speed for flap retraction. Noted by Captain at which time he calls for flaps to zero.
13:44:30 CAPT: "Flaps zero."		
Airspeed - increasing past 158 kts	Airspeed indicator -Observed by F.O.	Confirms safe flap retract speed.
Flap handle to zero detent. Flap indicator tapes move to up position	SOP - First Officer	Flaps retract, confirmed by the indicator tapes, as observed by the First Officer.
Throttles - Auto throttles engaged, Thrust set to Climb.	SOP - Thrust computer	Commanded by the Captain - set by the First Officer to set thrust for climb.
13:44:45 CAPT: "Climb thrust, auto throttles on, NI."		

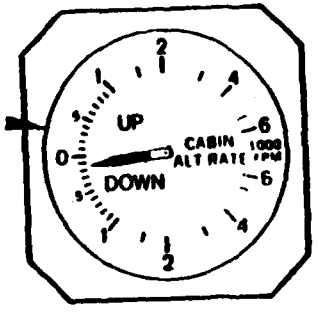
	DATA	SOURCE	USAGE
	TAKE OFF CON'T		
	Auto throttle engage switches, 1 & 2 - on while holding in the N1 Mode selector	SOP - F.O. 	Throttles will now adjust to and maintain the climb limit in the thrust computer.
	Airspeed - increasing through 189 kts (slat retract speed)	A/S ind - Capt	Safe speed for slat retraction.
13:44:00	CAPT: "Slats - retract."		
	Speed, altitude & attitude - check	SOP - F.O.	Verify conditions are satisfactory for slat retraction.
	Flap/slat handle - up/retract	SOP - F.O.	"Clean up" airplane for acceleration to climb speed.
	Slat indicator lights: Take off light - out Disagree light - on then out	Visual - F.O.	Verify slat retraction.
	Airspeed - increasing through 204 kts	A/S ind, T/O data card - Capt	Indicates safe maneuvering speed.
	Bank selector - 25°	SOP - Capt	Permits greater bank angle.
	Airspeed - 224 kts	A/S ind, T/O data card - Capt	Climb speed to 3,000' above the ground.
	IAS hold switch - engage	SOP - Capt 	Centering the pitch bar will maintain this speed.
13:45:05	Clearance to departure control	Denver tower - F.O.	For departure vectors.
	DENVER TOWER: "United two eighty heavy, Denver departure now on 128.05."		
	F.O.: "Roger, United two eighty going to departure on 128.05."		
13:45:10	VHF com radio - tuned to 128.05	Denver tower - F.O.	To contact departure control.
	F.O.: "Denver departure, United two eighty heavy on 128.05, climbing to 10,000'."		
	DENVER DEPT.: "Roger United two eighty, have you in radar contact. Right turn now to 100° to intercept the Denver VOR 072 radial, procede on course."		
13:45:25	F.O.: "Roger, turning to 100°, United two eighty."		
	Heading select knob - pull out	SOP - Capt 	The heading having been previously selected, it is only necessary to pull out the knob. Heading select will command a turn to 100°.

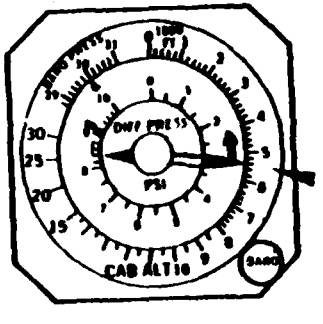
	DATA	SOURCE	USAGE
	TAKE OFF CON'T		
	Altitude - passing 7,300'	Altimeter - Capt	Safe altitude for Cabin crew to leave their seats.
	Seat belt and no smoking sws - auto	SOP - Capt	Sounds a chime and turns off the signs.
13:45:30	Cabin announcement:		
	CAPT: "Matt, will you make the announcement?"		
	S.O.: "Roger, will do."		
	PA handset and PA selector - on	SOP - S.O.	Activate cabin speakers.
	S.O.: "Ladies and gentlemen, the Captain has turned off the no smoking and seat belt signs. You are free to move about the cabin, but we suggest that while in your seats, you keep your belts fastened in case of unexpected turbulence. Please smoke only in designated area. Smoking is not permitted in the lavatories at any time."		
13:46:00	Altitude - 8,300', accelerate to 250 kts	SOP - Capt	Max speed below 10,000'.
	Vertical speed wheel - 1,000 FPM up	SOP - Capt	Shallows the pitch attitude commanded by the FCS to permit acceleration.
			
	IAS hold switch - engage at 250 kts	SOP - Capt	Centering the pitch bar will maintain this speed.
			
13:46:30	Autopilot number 1 - engage	SOP - Capt	Auto pilot will follow the engaged modes.
13:46:45	NAV selector - press	SOP - Capt	The auto pilot will now capture and maintain both the armed vor and the selected altitude.
			
	Spoilers - disarm	SOP - F.O.	Prevent inadvertent deployment in flight.
	Ignition sws - off	SOP - S.O.	Save wear on igniters.
13:47:30	Pressurization - check	SOP - S.O.	Verify airplane is pressurizing.
	Vane heat 1 & 2 - Check min amps 1.6	SOP - S.O.	Preclude ind air speed problems in flight.
13:47:40	After take off checklist:		
	CAPT: "Matt, the after take off checklist please."		
	S.O.: "Roger, in progress."		

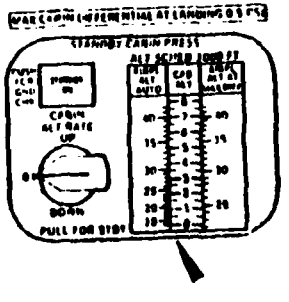
	DATA	SOURCE	USAGE
	AFTER TAKE OFF After take off checklist:	Checklist card - S.O.	Verify pertinent items have been accomplished. Completed silently by the S.O. and announced when complete.
		MAIN LANDING GEAR DOOR UPLATCH -	CHECKED
		SPOILERS -	DISARMED
		FLAPS & SLATS -	UP/NO LIGHTS
		GEAR -	UP, NO LIGHTS
		IGNITION -	ON/OFF
		VANE HEAT -	CHECKED
		S.O.: "After take off checklist is complete."	
		CAPT: "Roger thank you."	
13:47:50	Cabin altitude - approximately 5330'	Cabin alt. gage/auto press. controller	Controller maintains departure field elevation in the cabin until the airplane has climbed 5,000'.
	Cabin vertical speed - zero	Cabin V/S ind - S.O.	Verifies normal pressurization.
13:47:55	Cabin differential pressure - increasing	Diff press gage - S.O.	Verifies normal pressurization.
13:48:00	Clearance to Denver Center	Denver departure - 128.05 - F.O.	For enroute flight monitoring and clearances.
		DENVER DEPT.: "United two eighty heavy, Denver departure."	
		F.O.: "Denver departure, United two eighty, go ahead."	
		DENVER DEPT.: "Change now to Denver Center on 125.95."	
		F.O.: "Roger, going to Denver center on 125.95."	
	VHF radio - tuned to 125.95	Freq from Denver departure	to contact Denver center.
		F.O.: "Denver center, this is United two eighty heavy on 125.95, climbing to flite level 20.0."	
		DENVER CNTR.: "Roger United two eighty heavy, have you in radar contact."	

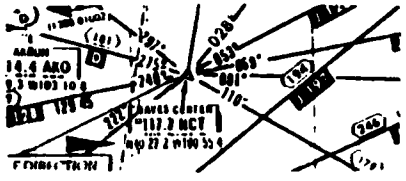
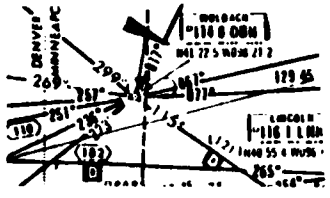
	DATA	SOURCE	USAGE
	AFTER TAKE OFF CON'T		
	Approaching 10,000' MSL 9,250'- altitude alert lt - on. 9,750' (approx) - Alt cap begins, Alert light goes out	Altimeter - Captain - First Officer Altitude alert system Auto pilot	Monitor auto pilot capture of selected altitude. Alerts Capt and F.O. to approaching altitude. Levels airplane off at correct altitude.
13:48:15	10,000' - Alt hold engages		Auto pilot now holds 10,000'.
	Speed selector - set to 300 kts	SOP - Capt	Accelerate to enroute climb speed - permissable at 10,000' and above.
	Speed selector - pull out (reaching 300 kts.)	SOP - Capt 	Auto throttle will now maintain 300 kts.
	CLIMB		
13:48:30	Climb clearance - (about) 15 NM out	Denver Center - First Officer	Begin climb out.
	DENVER CNTR.: "United two eighty, heavy, Denver center."		
	F.O.: "Denver Center, United two eighty go ahead."		
	DENVER CNTR.: "United two eighty is cleared to flight level 20.0."		
	F.O.: "Roger, two eighty is cleared to flight level 20.0."		
	Climb thrust - set	Capt -(presses N1 selector button) 	Auto throttles will advance to climb thrust limit already set on the thrust computer.
	IAS button - press	*Capt* 	Auto pilot will maintain the existing 300 kts by climbing, as the throttles advance to climb thrust.
	Altitude selector - set to cleared flight level. (20.0)	SOP - clearance - First Officer	Rearms the altitude alert system for 20,000'.
	Altitude selector - pull out	SOP - First Officer 	*Arms the FGS to automatically capture the altitude.*
13:52:00	Out bound VOR radial - intercept (072° radial Denver VOR)	FGS - auto pilot 	Auto pilot begins turn to out bound course, monitored by the Capt and First Officer.

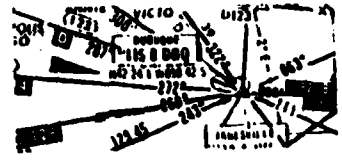
DATA	SOURCE	USAGE
CLIMB CON'T		
Out bound VOR radial - tracking	FCS - auto pilot 	Auto pilot reaches and maintains the radial center line, Captain and First Officer continue to monitor.
13:52:30 Altimeter setting - 29.92 (passing 18,000')	SOP - Capt and First Officer	Assure proper vertical traffic separation.
Runway turn off lights - off	SOP - Capt	Not required above 18,000'.
Two pack operation:		
Engine 2 bleed air switch - off	SOP - Second Officer	Conservation of fuel.
Pack indicator sel - #2	SOP - Second Officer	To monitor pack valve while setting up for pack shut down
Pack 2 selector hot / off	SOP - Second Officer	To close the pack inlet door to reduce drag.
1-2 isolation valve - open	SOP - Second Officer	Provide air to #2 pneumatic system with #2 bleed off, and then to number 1 after the next step when 1 is turned off and two back to auto.
Number 1 bleed - off & number 2 bleed - auto	SOP - Second Officer	Provides hotter air to the cargo compartment.
Cabin altitude - descending.	Cabin altimeter - S.O.	Verify cabin is starting to descend slowly according to the automatic schedule. (Auto schedule begins descending the cabin as the airplane climbs 5,000' above the departure elevation on this flight from DEN to ORD).







DATA	SOURCE	USAGE
CLIMB CON'T		
Clearance to Denver center (next sector)	Denver center - F.O.	Enroute clearances and flight monitoring.
DENVER CNTR.: "United two eighty heavy, change now to Denver center on 135.5."		
F.O.: "Roger, going to Denver center on 135.5."		
13:53:30 VHF radio - tuned to 135.5	Denver center - F.O.	To initiate contact.
F.O.: "Denver center, this is United two eighty heavy on135.5, climbing to flight level 20.0."		
DENVER CNTR.: "Roger, two eighty, we have you in radar contact. You are cleared to continue climb to flight level 37.0. Maintain 37.0."		
F.O.: "Roger, understand United two eighty is cleared to maintain 37.0."		
Altitude selector - set 37,000'	Clearance - F.O.	Rearms altitude alert system for 37,000".
Altitude selector - pull out	SOP - F.O.	Arms the FGS to capture the selected altitude.
13:54:30 Enroute waypoints - load in Lat and Long	Enroute Hi alt chart - Capt/F.O.	For navigation - may permit direct clearances, saving time and fuel.
INS CDU - select remote on 1 & 2	Capt & F.O.	Permits data to be inserted in both INS's using on keyboard.
INS CDU - select waypoint on 1 & 2	Capt & F.O.	Preparation for loading data.
Waypoint sel - 2 (both INS's)	Capt & F.O.	
Load Lat & Long - Hayes Ctr.:	Enroute High Altitude Chart	Capt reads - First Officer keys in data.
CAPT.: "North 40°27.2'"		F.O.: "North 40°27.2' - confirm?"
"Confirmed."		"Roger, inserting."
"West 100°55.4'"		"West 100°55.4' - confirm?"
"Confirmed."		"Roger, inserting."
Waypoint sel - 3 (both INS's)		
Load Lat & Long - Wolbach:		
CAPT.: "North 41°22.5'"		F.O.: "North 41°22.5' - confirm?"
"Confirmed."		"Roger, inserting."
"West 98°21/2'"		"West 98°21.2' - confirm?"
"Confirmed."		"Roger, inserting."

DATA	SOURCE	USAGE
CLIMB CON'T		
Waypoint sel - 4 (both INS's)	Enroute high altitude chart	Captain reads - First Officer keys in the data.
Load Lat & Long - Dubuque:		
CAPT.: "North 42°24.1'"		F.O.: "North 42°24.1' - confirm?"
"Confirmed."		"Roger, inserting."
"West 90°42.5'"		"West 90°42.5' - confirm?"
"Confirmed."		"Roger, inserting."
13:58:00 Remote keys - off (both INS's)	SOP - Capt & F.O.	Return INS to normal operation.
14:03:00 Course change, intercepting the HCT 235° radial. (DME - 121 NM from DEN)	Denver 6 SID - Capt & F.O.	Navigation.
VOR NAV radios 1 & 2 - tune 117.7, Hayes Ctr.	Freq from enroute chart - Capt & F.O.	Navigate to Hayes Center.
VOR course mode - engages	FGS NI | ALT | VOR CRS | IAS HOLD	Course mode holds a parallel track with the course setting (072°) when the freqency or course are changed, for a period of time.
Course selectors, 1 & 2 - set to 055°	Inbound course to Hayes Center	Autopilot will turn to parallel this new course.
Flight guidance system - tests to see if a useable signal is being recieved, then returns to the track mode or reverts to heading hold.	Automatic NI | ALT | VOR TRK | IAS HOLD	Being close to the track the auto pilot has returned to the tracking mode, tracking now inbound to Hayes Center VOR.
Cruise data - compute	Flight handbook - S.O.	Provide the correct speed to set in the auto throttle speed control system. Be aware of weight/altitude restrictions, if any and buffet protection.

CAPT: "Matt have you got the cruise data coming up?"

S.O.: "Have it for you in just a minute. We are about 335,000# for the start of cruise. I'll get the book out."

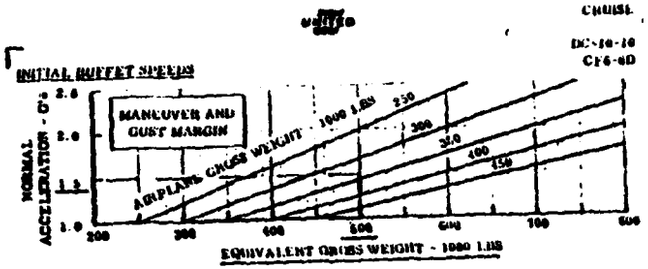
CAPT: "I'll want the indicated speed, low and high buffet speeds, and see how we look for our 37,000' altitude. And I'd like to know about what fuel consumption we should expect, also.

S.O.: "Roger coming right up."

DATA	SOURCE	USAGE

CLIMB CON'T

Equivalent gross weight:
500,000#
(1.5 g's / 335,000#)

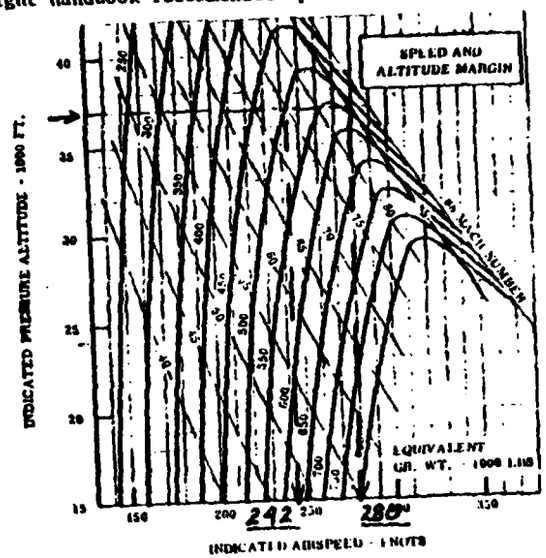


To enter the speed and altitude margin chart.

Rough air speed - 280 to 287 or .80 to .85 mach

Flight handbook recommended speeds

For penetrating turbulent air.



Lo speed buffet - 242 kts
(Altitude / Eqlv GW line)

Stall protection

Hi speed buffet - 280 Kts
(Altitude / Equiv GW line or mach .85 line)

Avoid excessive speed.

Spread between hi and lo speed - 38 kts

Validates 37,000' as a satisfactory altitude.

DATA | SOURCE | USAGE

CLIMB CON'T

CRUISE

3 ENG CRUISE
MACH .83

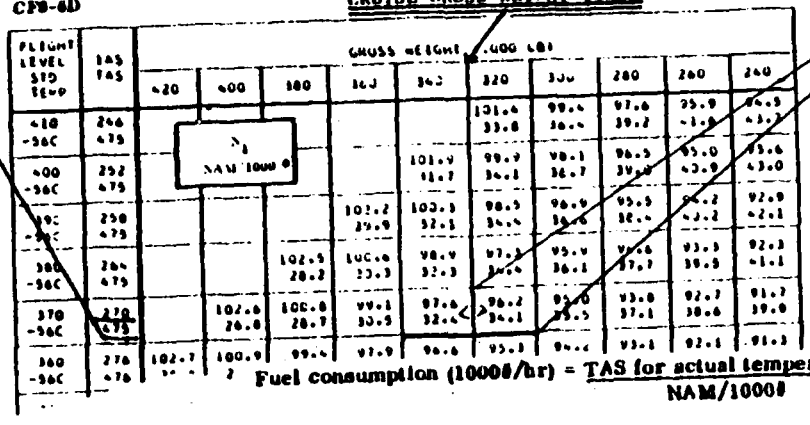
UNITED

DC-10-10
CF6-6D

CRUISE GROSS WEIGHT 330.0

IAS - 270 kts
TAS - 475 kts
N1 - 96.9 %
FUEL FLOW - 4755#/hr/engine

N1 - 96.9
NAM/1000# - 33.3

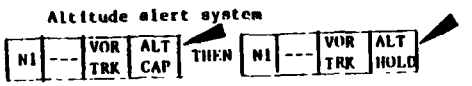
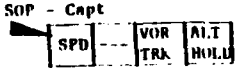


475 ÷ 33.3 = 14.264 (14,264#/hr - all 3 engines or 4,755# each.

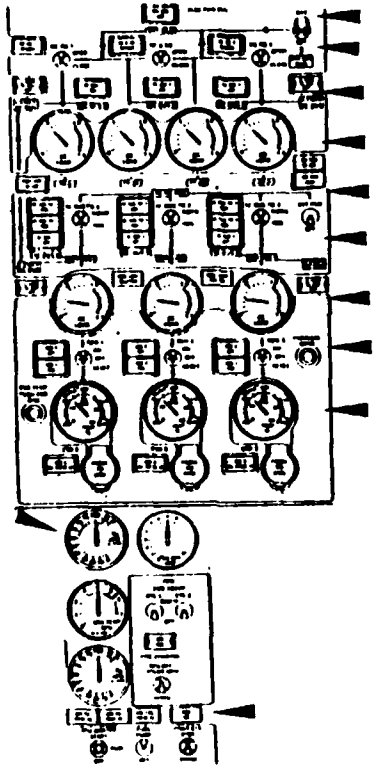
Fuel consumption (1000#/hr) = TAS for actual temperature / NAM/1000#

S.O.: "Captain George, we should indicate 270 knots at 37,000'. The fuel consumption should be around 4,755 pounds per engine at 96.9% N1. Using one and a half "G's" I get a lo buffet speed of 242knots and a high of .85 mach, that's about 280Knots. That gives us a Spread of 38knots which shows that 37,000' is fine for our weight."

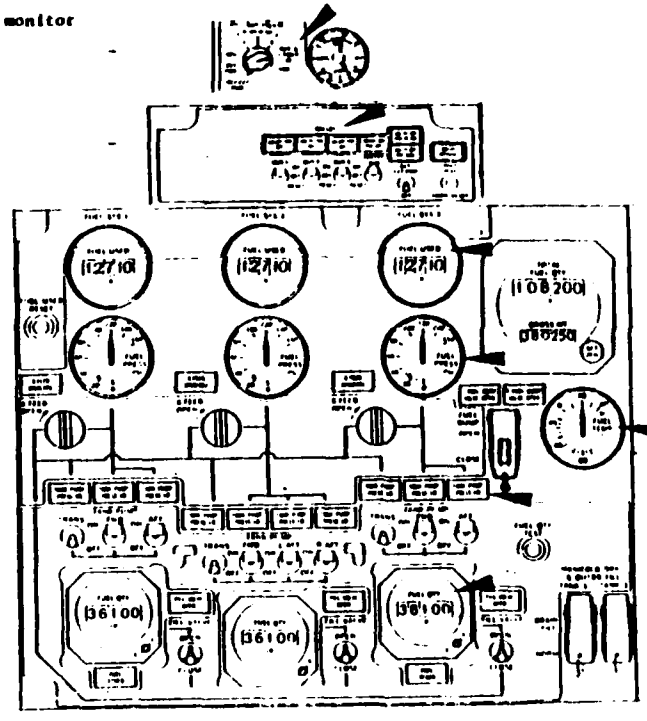
CAPT: "Okay Matt thenk you. Our indicated 270 puts us right in the ball park."

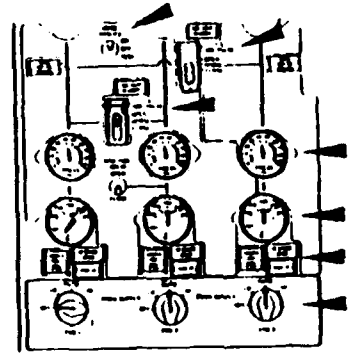
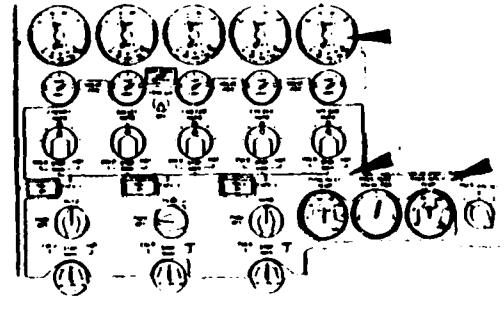
	DATA	SOURCE	USAGE
	CLIMB CON'T		
	Chicago weather requested by Captain	Denver flight watch - Second Officer	Information for cabin announcement and for planning.
	ACARS - select VOX mode	SOP - Second Officer	Change from data to voice mode for voice operation.
	VHF radio 2 - tune 122.0	From FOM or enroute chart	
	S.O.: "Denver flight watch, United two eighty heavy."		
	DENVER FLIGHT WATCH: "United two eighty heavy, go ahead."		
	S.O.: "Two eighty is requesting the Chicago weather for 15:30."		
	FLIGHT WATCH: "Stand by two eighty."		
14:05:30	Flight level - passing 36.0	Altimeter - First Officer	Required call 1,000' below assigned altitude.
	F.O.: "Captain, we are approaching our flight level in 1,000'."		
	CAPT: "Thanks, Mike, got it."		
	FLIGHT WATCH: "United two eighty, Denver flight watch with weather."		
	S.O.: "United two eighty, ready to copy."		
	FLIGHT WATCH: "Chicago 15:30 weather 2300 broken, 9,000 overcast, 4 miles in haze, temperature 76°, wind 160°, 11 knots with gusts to 22."		
	S.O.: "Roger Denver, copied all okay, thank you, two eighty."		
	ACARS - select data mode	SOP - Second Officer	Return to data mode for normal radio watch.
	Cabin announcement	Capt - PA	Keep passengers and attendants informed of progress.
	CAPT: "Ladies and gentlemen, this is Captain George. We are approaching our cruising altitude of 37,000', and expect an on time arrival. Chicago is a comfortable 76°. Winds are a little gusty and the sky is cloudy. At this altitude the flight should be smooth."		
14:06:30	Cruise altitude - capture (37.0)	Auto pilot - flight guidance system	Pilots monitor to assure proper level off.
	Altitude alert light - on/off	Altitude alert system	Alerts pilots to approaching level off.
			
	Speed selector - set 270 kts	Cruise data - Capt	Sets proper speed for flight level to maintain mach 81.
	Speed selector - pull out	SOP - Capt	Auto throttle holds selected speed - auto pilot holds captured altitude.
			

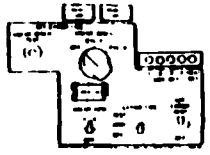
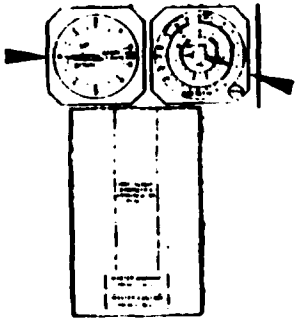
DATA	SOURCE	USAGE
CLIMB CON'T		
Cruise thrust limit - set	SOP - Capt (presses CR button on the thrust computer.	Limits auto throttles to maximum cruise thrust.
CRUISE		
Engine and airplane systems - monitor	SOP - F.O. - S.O.	Verify satisfactory operation of all systems.
Engines:		
N1 RPM -		Desired RPM - not to exceed the limit.
Exhaust gas temp. -		Normal range - within limits.
N2 RPM -		Normal range - within limits.
Fuel flow -		Normal for thrust condition.
Hydraulic system:		
Temperature -		Hydraulic temperature normal (may be as low as 0°.
Quantity -		Quantity normal - no deviation from bug settings, except 1 gallon increase on #1 due to gear retraction.
Annunciator lights -		Annunciator lights - off.
Hydraulic pressure -		Pressure normal.

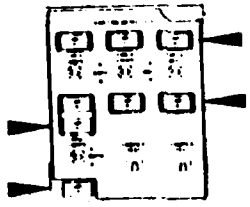
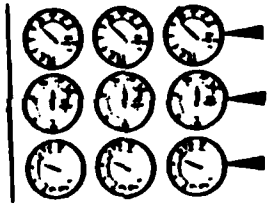
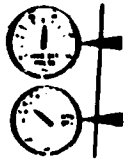
DATA	SOURCE	USAGE
CRUISE CON'T		
Engine and airplane systems - monitor		
Electrical panel:		
Battery bus -		Verify normal power.
DC tie -		Verify switches open, lights off.
DC busses -		Verify normal power.
DC loads -		Verify normal, no overload condition.
AC tie -		Verify powered for backup electrical power in the event of generator failure.
AC busses -		Verify normal position.
AC loads -		Verify normal, no overload condition.
Generators -		Verify normal operation.
CSD's -		Verify normal temperatures, and no low oil pressure.
APU panel:		
Indicators and lights. -		Normal, lights out.

DATA	SOURCE	USAGE
CRUISE CON'T		
Engine and airplane systems - monitor		
Volt/amp/freq sel	-	Verify in bat. & left emerg. position and volts and frequencies in the green band.
Galley panel:		
Switches and lights	-	verify normal power.
Fuel panel:		
Fuel used		Normal consumption all engines.
Pressure		Normal range for engine operation.
Temperature		Verify above -36°C.
Annunciator lights		Verify out.
Quantity gages		Verify normal consumption and no unwanted transfer.



DATA	SOURCE	USAGE
CRUISE CON'T		
Engine and airplane systems - monitor		
Pneumatic panel:		
Wing anti-ice	- 	Verify on or off as required.
Isolation valves	-	1-3 - normal (valve closed to isolate syst.), 1-2 - open to pressurize # system.
Pressure	-	Normal.
APU isolation valve	-	*Closed to isolate the APU from the pneu. system.*
Temperature	-	2 & 3 normal - 1 ambient for normal operation.
Annunciator lights	-	Verify off for normal operation.
Pneumatic switches	-	2 & 3 - verify in auto, 1 - off (one pack off conserves fuel.
Air conditioning panel:		
Compartment/duct temps.	- 	Comfortable temperature in the cabin, safe temperature in the ducts.
Pack indicator lights	-	Out for normal operation.
Pack switches	-	1 & 3 in auto, 2 off for normal operation.
Pack temperatures	-	Inlet and discharge temperatures in safe operating range.

DATA	SOURCE	USAGE
CRUISE CON'T		
Engine and airplane systems - monitor		
Cargo compartment:		
Temperature controls and indicators. -		Verify atisfactory temperatures
Smoke and fire indicators -		Monitor for smoke and or fire warning and protection in the compartment.
Oxygen system:		
Line pressure -		Verify normal.
Quantity -		Verify sufficient.
Pressurization system:		
Cabin altitude rate zero -		Zero to indicate no pressurization leak.
Cabin altitude 6200' -		Verify correct for flight level 37.0.
Differential pressure -		Verify in the white operating range.
Annunciator light panel -		All lights off for normal operation.

DATA	SOURCE	USAGE
CRUISE CON'T		
Engine/APU fire detection system -		All lights off indicates no fire or overtemp in engine or APU compartments.
Second Officer's engine inst. panel:		
Oil pressure -		Normal and not increasing. (Increasing oil pressure indicates engine problem developing).
Oil temperature -		Normal.
Oil quantity -		Normal and not increasing or decreasing from the reminder bug setting.
Water system:		
Water pressure -		Normal.
Water quantity -		Normal.
14:06:30 Airplane/engine performance data:	Engine instruments - Second Officer	Instrument readings are recorded for use by maintenance for airplane/engine history.
S.O.: "Captain George, I would like to take the engine readings now."		
CAPT: "All right Matt, go ahead. Do you want the auto throttles off."		
S.O.: "Right."		
Auto throttles - off	SOP - Capt	Provides steady state of operation for the readings.

DATA	SOURCE	USAGE
CRUISE CON'T		
Airplane/engine performance data con't		Provide proper operating conditions for the data recording.
Return to 3 pack operation:	SOP - S.O.	
1 - 2 isolation valve - closed	Additional procedure - S.O.	Isolate systems one and two.
Engine 1 bleed switch - auto	" " - S.O.	Pressurize system 1.
Engine 2 bleed switch - off	" " - S.O.	Prepare to return pack 2 to operation.
Pack indicator sel sw - pack 2	" " - S.O.	Monitor valve position indicator while setting valve to approximately normal operating position.
Pack 2 selector sw - manual	" " - S.O.	To manually position valve.
Hold toward cold until even with 1 & 3	" " - S.O.	Setting in this position prevents an over heat when the system is turned on.
Pack 2 selector sw - Auto	" " - S.O.	Pack is now ready for air.
Engine bleed sw - auto	" " - S.O.	Pack will now produce conditioned air.

NOTE: The location in time for the cruise system monitoring and engine recording could have been any where in the cruise area rather than here at the beginning of cruise. Generally recording of engine instruments is done when atmospheric conditions are smooth. System monitoring is a continuing function and is not specifically accounted for in the time line. Engine recording occupies approximately 3 to 5 minutes.

DATA	SOURCE	USAGE

CRUISE CON'T

Airplane/engine performance data:

N1 RPM -

Exhaust gas temperature -

N2 RPM -

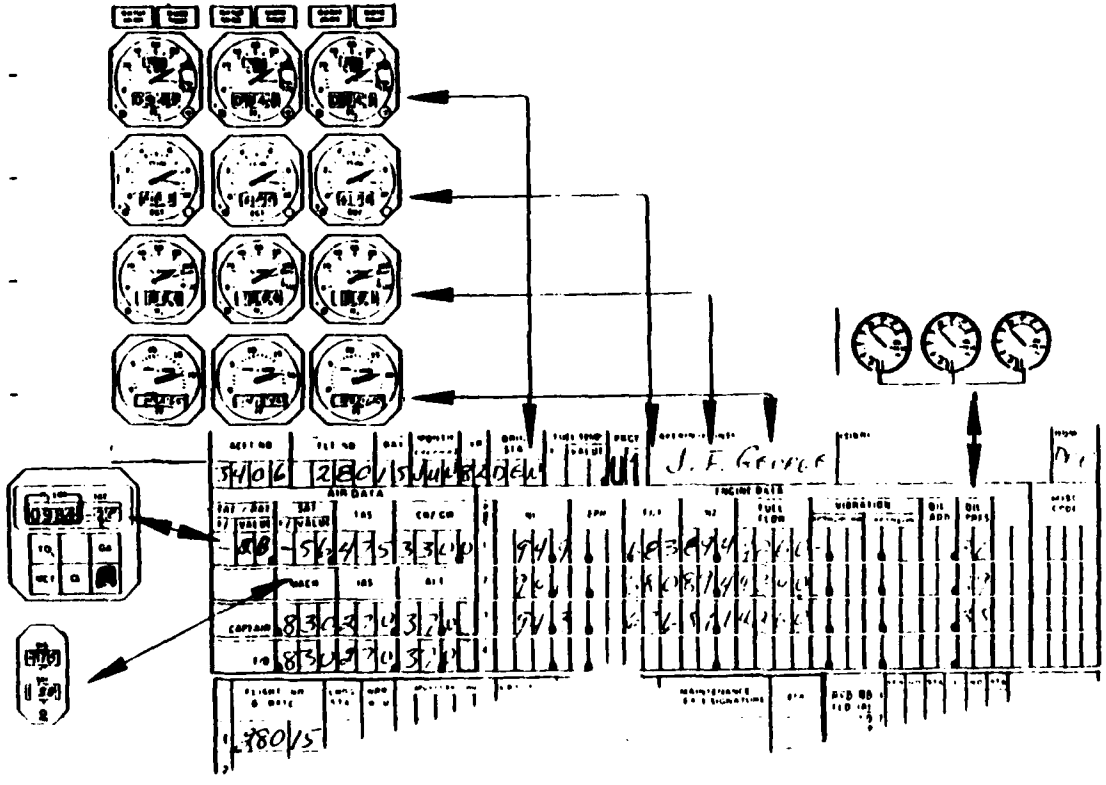
Engine oil pressure

Fuel flow -

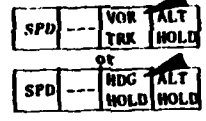
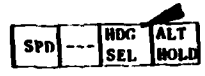
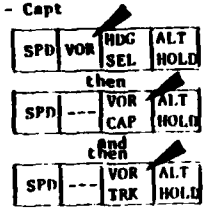
Total air temp. -

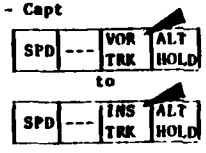
True airspeed -

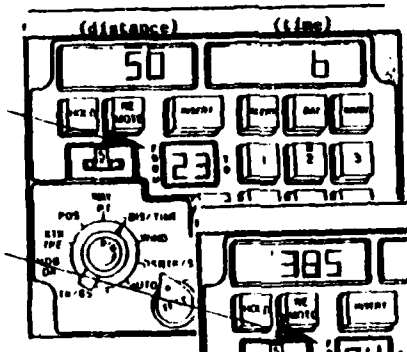
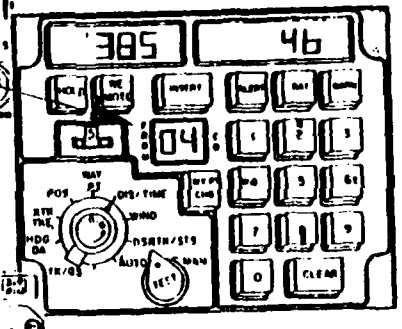
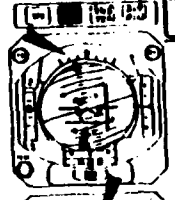
Static air temp. -



DATA	SOURCE	USAGE
CRUISE CON'T		
14:09:51 Airplane/engine performance data:		
	S.O.: " Okay Captain, I have the readings, thank you."	
	CAPT: "Very good. Auto throttles coming on. Are you going back to two packs?"	
	S.O.: "Right."	
Coffee break:		
	Capt: "Matt, I could use a cup of coffee."	
	S.O.: "Okay, how do you like it?"	
	CAPT: "Black."	
	S.O.: "Mike, do you want one?"	
	F.O.: "Right, with cream and sugar."	
Service interphone	P.A. handset - Forward attendant call switch - S.O.	Calls attendant to interphone.
	FFA: "This is the first flight attendant, what can I do for you?"	
	S.O.: "Can you bring us two blacks and one with cream and sugar please?"	
	FFA: "Coming right up."	
Two raps on cockpit door	*Flight attendant's prearranged signal*	Signal for Second Officer to open door.
	FFA: "Here's your coffee. How are we doing?"	
	CAPT: "No problems. May be a little choppy further on, we'll alert you if it looks about to happen. Everything okay back there?"	
	FFA: "Yes we're doing fine, please don't forget to ask for two wheel chairs to meet us."	

DATA	SOURCE	USAGE
CRUISE CON'T		
Return to two pack operation	SOP - Second Officer (as before)	Conserve fuel.
Station passage - Hayes Center	Course indicator: Course deviation bar - swings lt/rt To/from indicator - from to to from. RMI VOR pointers - swing nose to tail.	Navigation - recognize station passage.
VOR course mode - engages (auto.)	Flight guidance system: 	Maintains a heading parallel to the track while over the zone of confusion.
Course selectors - set to 053°	High altitude chart - Capt & F.O.	In the course mode the autopilot will turn the airplane to parallel airway J 128 toward Wolbach until out of the zone of confusion.
VOR track mode or heading hold mode engages.	Flight guidance system: 	Resumes tracking toward Wolbach or reverts to heading hold if no useable signal is being received.
((If heading hold mode engages:		
Heading selector - pull,	SOP - Capt	Engages heading select mode.
Converging heading - select	SOP - Capt 	Auto pilot will steer toward the desired course.
NAV button - press	SOP - Capt 	Arms the FCS to capture the track.
Capture mode engages (auto)		Auto pilot steers to course center line.
Track mode engages (auto))		Auto pilot tracks J 128 toward Wolbach.))
14:10:00 Time over Hayes Center - 14:10	VOR - Capt	Compare with flight plan estimated time, to check progress

DATA	SOURCE	USAGE
CRUISE CON'T		
Inertial navigation:		
Direct clearance - present position to Dubuque.	Denver center	Direct route can save fuel and time, and may assist traffic control.
DENVER CNTR.: "United two eighty heavy this is Denver center."		
F.O.: "Go ahead Denver this is United two eighty."		
DENVER CNTR.: "United two eighty, are you INS or OMEGA equipped?"		
F.O.: "United two eighty has INS."		
DENVER CNTR.: "Roger two eighty, you are cleared direct from present position to Dubuque. contact Minneapolis on 135.1 now."		
14:20:30 F.O.: "Roger, understand United two eighty is cleared direct to Dubuque. Going to Minneapolis on 135.1."		
INS/radio switches - INS	SOP - Capt - F.O.	Switches course indicators from magnetic/radio information to true/inertial information. (The auto pilot *will continue to track the VOR* at this time, as the INS/radio switch does not directly affect the FGS mode in use.)
NAV mode switch - press	SOP - Capt 	Arms the FGS to capture and track the INS course. In this case the airplane is on course to Wolbach and the INS track coincides with the VOR track so the auto pilot now tracks the INS and the mode annunciation changes directly to INS track.
No. 1 INS data sel. - dis/time	SOP - Capt	Shows distance and time in minutes to the next way point. (In this case wolbach.)
No. 2 INS data sel. - xtk/tke	SOP - F.O.	Monitors performance of no. 1 INS, which is guiding the airplane. It measures cross track errors.
Both INS way point change sws - press	SOP - Capt - F.O.	Preparation for changing course directly toward Dubuque.
Way point change sws and insert sws - light up.	Automatic	Indicate INS's are ready for change to be inserted.
Both INS's - key in 0 - 4 (0 is always present position and 4 is Dubuque.	INS memory from way points previously inserted	Instruct INS's to navigate direct from present position to Dubuque.

DATA	SOURCE	USAGE
CRUISE CON'T		
Inertial navigation:		
The to/from window changes from: waypoints 2 to 3 (Hayes Cntr. to Wolbach)		Changes the Navigation track of the INS from: Hayes Center to Wolbach
TO:		TO:
0 to 4 (present position to Dubuque.		Present position direct to Dubuque.
Insert key - press		Auto pilot will now steer to Dubuque.
Attitude indicator shows - bank right to the new course		Permits pilots to monitor INS Navigation.
Course indicator shows - turning toward Dubuque.		Permits pilots to monitor INS Navigation.

DATA	SOURCE	USAGE
CRUISE CON'T		
14:21:00 VHF radio tuned to 135.1	Denver center - F.O.	Initial contact with Minneapolis center.

F.O.: "Minneapolis center, this is United two eighty heavy, on 135.1, cruising 37.0."

MINNEAPOLIS CNTR.: "Roger, United two eighty we have you in radar contact, direct to Dubuque."

14:25:00 Passing abeam Wolbach	VOR/RMI indicators	Pointers show bearing to Wolbach
Time abeam OBH - log on flight plan	Capt - F.O.	Monitor progress against estimates.
Fuel remaining - check	Capt - S.O.	Verify normal consumption.

CAPT: "Matt, what is our fuel remaining right now?"

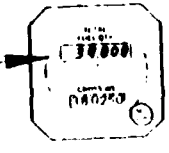
Quantity - 39,000#	Quantity gages - S.O.	

S.O.: "Captain, we have 39,000#."

Fuel remaining - Compare	Quantity gages - flight plan	Monitor for normal operation.

809NM 3427/3734 3171/3478 CLB 09 008 2901 DEN 526

RCA	159	37	822	04	39	476	24044	043	519	23	98	428
IRT	33	37	822	04	39	476	24044	043	519	4	9	419
OBH	129	37	821	03	39	475	25046	046	521	15	35	384
FOD	355	37	820	02	39	473	26060	060	533	40	93	291
ORD	133						26037	032		23	21	270



CAPT: "Fuel looks okay, we have 39,000# and the flight plan shows we should have 38.4."

14:29:00 Change to next sector of Minneapolis:

MINNEAPOLIS CNTR.: "United two eighty heavy, Minneapolis, go ahead."

F.O.: "This is United two eighty, go ahead."

MINNEAPOLIS CNTR.: "United two eighty change now to Minneapolis on 134.35."

F.O.: "Roger two eighty, going to Minneapolis on 134.35."

DATA	SOURCE	USAGE
CRUISE CON'T		
VHF radio tuned to - 134.35	Minneapolis Center - F.O.	Check in
F.O.: " Minneapolis center, United two eighty, heavy, on 134.35, maintaining 37.0, go ahead."		
MINNEAPOLIS CNTR.: "Roger, United two eighty heavy, we have you on radar direct to Dubuque."		
Enroute weather penetration:		
Cumulus clouds ahead	Visual	Activate radar/alert flight attendants
Radar - turn on	Capt	Choose best flight path through cloud tops, for safety and passenger comfort.
Function selector - normal	SOP - Capt	To show precipitation ahead and identify possible turbulent areas.
Tilt control - 2° to 3° down	SOP - Capt	Show ground clutter ahead at 75% of selected range, for best effect.
Scan for:		
Sharp edges on echo -	Radar returns (echos)	Indications of precipitation which can mean turbulence.
Contoured echos -		
Steep gradients -		
Hooks, fingers or scallops -		
Cabin announcement - seat belt sign on	Capt	Prepare cabin attendants and assure that passengers are belted in.
CAPT: "Ladies and gentlemen, this is Captain George. We are showing some shower activity ahead and there may be some light turbulence. The seat belt sign has been turned on and you should remain in your seats. We will advise you as soon as it safe to leave your seats again."		
Clearance to deviate from flight path.	Capt - F.O.	Avoidance of roughest areas.
CAPT: "Mike, call the center and ask for permission to deviate around that cell ahead, looks like North about 5 or 10° should do it."		
F.O.: "Right."		
Call for clearance:		
F.O.: "Minneapolis center United two eighty, go ahead."		

DATA	SOURCE	USAGE

CRUISE CON'T

MINNEAPOLIS CNTR.: "United two eighty, Minneapolis."

F.O.: "Minneapolis, two eighty would like to deviate about 5 or 10° left for weather, go ahead."

MINNEAPOLIS CNTR.: "That's approved two eighty. Our scope shows that 10° would be better. Steer left to 067° now and we'll guide you through."

F.O.: "Thanks. Two eighty is steering left to 067°.

Heading selector - set to 067° — SOP - Capt — Preselect new heading.

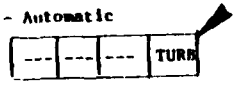
Heading selector - pull out — SOP - Capt — Flight guidance system (auto pilot) turns airplane to selected heading.



Turbulence:

Turbulence mode - select — SOP - Capt — Flight guidance system maintains constant attitude *through the turbulent area.*

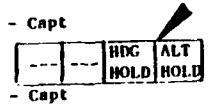
Auto pilot aws - CWS
Auto throttles - off
Stabilizer trim - off
(Auto pilot and auto *throttle* warning lights flash.) — FGS - Automatic



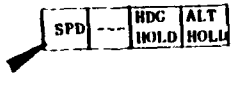
Auto pilot holds heading and pitch attitude.
Throttles remain at last setting, to maintain speed.
Maintain last trim setting.
Alert pilots that the systems are off. (Pressing the lights extinguishes them.
(Airplane will stay close to course & alt. through turbulence. CWS - Control Wheel Steering - permits the pilot to operate the airplane through the *auto pilot with dampened* elevators to reduce elevator loads. This mode of flight is similar to "fly by wire".)

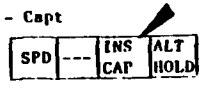
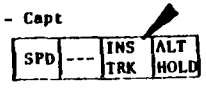
Turbulence over:

Auto pilot - engage to command — SOP - Capt — Cancels the turbulence mode. Auto pilot engages in basic modes. Heading hold and altitude hold.

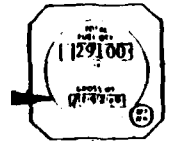


Auto throttles - engage — SOP - Capt — Throttles reestablish selected speed and hold it.



DATA	SOURCE	USAGE
CRUISE CON'T		
Resume navigation:		
MINNEAPOLIS CNTR.: "United two eighty heavy, go ahead."		
F.O.: "Minneapolis, United two eighty, over."		
MINNEAPOLIS CNTR.: "Two eighty, our scope shows you past the worst of it, you are cleared from your present position direct to Dubuque."		
F.O.: "Thank you Minneapolis, two eighty is cleared direct present position to Dubuque."		
Radio/INS switches - INS	SOP - Capt - F.O.	Return course indicators to true/INS function.
NAV mode selector - press	SOP - Capt	Arms the FGS to capture and track the INS course.
Auto pilot - turns right		The airplane is still within the INS capture range and so goes directly to CAP rather than arming, and would return to the original track.
Way point change sws - press (waypoint change and insert keys light up)	SOP - Capt - F.O.	To set the INS & FGS to go directly to Dubuque without returning to the original track. INS ready to accept waypoint changes.
From/to window - from 0 to 4	Previously inserted - still indicating	Shows navigational leg in progress.
Insert switch - press	SOP - Capt 	As before, 0 is present position and 4 is still Dubuque. INS shows center line on direct course to Dubuque.
Cabin announcement - seat belt sign off	SOP - Capt	Allow attendants to resume service and passengers to move about the cabin.
CAPT: "Ladies and gentlemen this is Captain George, the turbulent air is behind us and we expect smooth flying conditions from here on, so feel free to move about, however as before we suggest that your belts remain fastened while you are in your seats as occasional unforecast rough air may be encountered."		
14:36:00 Change to next sector of Minneapolis:		
MINNEAPOLIS CNTR.: "United two eighty heavy, Minneapolis center - over."		
F.O.: "Minneapolis United two eighty, go ahead."		
MINNEAPOLIS CNTR.: "United two eighty, change now to Minneapolis on 133.77, over."		
F.O.: "Roger Minneapolis chang'ng now to 133.77, good day."		

DATA	SOURCE	USAGE
CRUISE CON'T		
VHF radio 1 tune - 133.77	Minneapolis center - F.O.	Check in
F.O.: "Minneapolis center, United two eighty heavy on 133.77, maintaining 37.0, go ahead."		
MINNEAPOLIS CNTR.: "Roger United two eighty have you on radar, say your speed."		
F.O.: "United two eighty is maintaining 270 knots."		
MINNEAPOLIS CNTR.: "United two eighty, turn left now for spacing to 030°."		
F.O.: "Understand left to 030° for spacing, two eighty."		
CAPT: "Mike, ask if they will approve a speed reduction instead of turning."		
F.O.: "Okay Captain, will do." "Minneapolis center, United two eighty, will you approve a speed reduction instead of heading 030°?"		
14:37:30 MINNEAPOLIS CNTR.: "Roger two eighty reduce to 250 knots and maintain your present track."		
VOR radios, 1 & 2 - tune to 115.8	Enroute map - Capt & F.O.	Confirm distance & bearing to DBQ (back up INS)
Monitor VOR - DBQ	Aural - Capt & F.O.	Confirm proper call sign for Dubuque.
Weather check for Chicago conditions:	Flight watch - Capt & S.O.	To assess arrival conditions for approach.
VHF radio 2 - check 122.0	FOM - S.O.	Flight watch frequency for weather information.
ACARS - select VOX mode	SOP - S.O.	To permit voice operation.
S.O.: "Flight watch, United two eighty heavy,go ahead."		
FLIGHT WATCH: "United two eighty, this is flight watch, over."		
S.O.: "Flight watch two eighty would like the Chicago 15:30 weather."		
FLIGHT WATCH: "Stand by two eighty."		
FLIGHT WATCH: "United two eighty, flight watch with chicago weather."		
S.O.: "Flight watch two eighty go ahead."		
FLIGHT WATCH: "Chicago weather for 15:30 - twenty three hundred overcast, eight miles, temperature 76°, wind is one five zero at 15 gusts to 22."		
S.O.: "Thank you, copied all okay, two eighty."		
CAPT: "Thanks, Matt, I got all that."		
ACARS - select data mode	SOP - S.O.	Return to data mode, for normal radio watch.

DATA	SOURCE	USAGE
CRUISE CON'T		
14:52:00 Clearance to Chicago center:		
MINNEAPOLIS CNTR.: "United two eighty heavy, change now to Chicago center on 133.82."		
F.O.: "Roger, United two eighty, understand Chicago on 133.82, affirmative?"		
MINNEAPOLIS CNTR.: "That's affirm. two eighty."		
F.O.: "Roger, going to Chicago."		
VHF com 1 - tune to 133.82	Minneapolis center - F.O.	Initial contact with Chicago.
F.O.: "Chicago United two eighty heavy, on 133.82, maintaining flight level 37.0."		
CHICAGO CNTR.: "Roger United two eighty heavy, ident."		
F.O.: "Roger Chicago, two eighty ident."		
Transponder ident. switch - push	SOP - F.O.	Positive identification of United 280 on Chicago radar.
CHICAGO CNTR.: "Roger United two eighty copied your ident okay, say your speed."		
F.O.: "United two eighty is indicating 250 kts. for traffic spacing."		
CHICAGO CNTR.: "United two eighty resume speed at this time, your traffic is passing at two o'clock."		
F.O.: "Roger United two eighty going back to 270 kts, we have the traffic visually thank you."		
Speed selector - 270	Capt	Auto throttles will pick up speed to 270 kts
15:00:30 VHF com 2 radio - tuned to 135.15	FOM - Second Officer	Receive ATIS information.
ATIS: "This is Chicago, O'Hare International Airport - information golf. Measured 2,300 broken, 8,000 broken 8 miles. Temperature 76°, dew point 66°, wind 150° 15 knots, gusting to 22, altimeter 29.54. Arrivals 14 right, departures 14 left. Inform Chicago approach on initial contact that you have information golf."		
Landing data card - prepare	Second Officer - Flight Handbook - ATIS information - Gross weight indicator	Provide Captain with maneuvering, approach and threshold speeds.
Gross weight for landing - approx. 315,000# (current gage reading less approximately 5,000 lbs., *estimated to be burned.*)		Basis for landing data.

DATA	SOURCE	USAGE

CRUISE CON'T

LANDING DATA CARD:

Landing weight must not exceed:

STRUCTURAL LIMIT
3X01 - 3X47
Landing 347.8
Inflight, Landing flaps down (35 to 50) . . . 366.5

Handbook

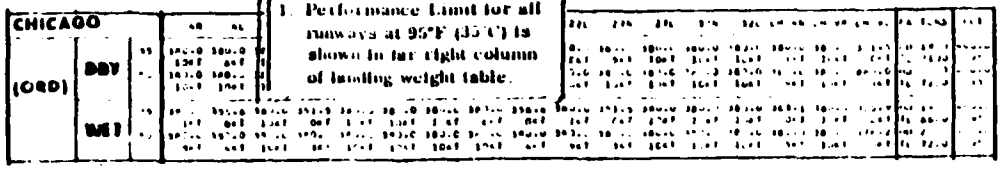
Compare with actual gross weight.

PERFORMANCE LIMIT

1. Performance Limit for all runways at 95°F (35°C) is shown in far right column of landing weight table.

Gross weight manual

Compare with actual gross weight.



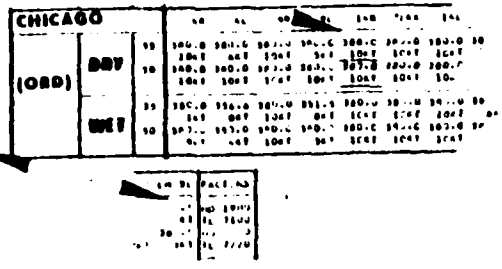
RUNWAY LIMIT

1 Weights shown under runway heading on weight pages

Corrected for wind if necessary.

Gross weight manual

Compare with actual gross weight.



WIND

1 Headwind - Zero wind wts shown - Adjust for headwind up to maximum of 30 knots. Actual headwind may exceed 30 knots

2 Tailwind - weights shown - valid - tailwind

DATA	SOURCE	USAGE

CRUISE CON'T

LANDING DATA CARD CON'T: _____

REF 128

GW 315.0 (CW 310 305 300 295 290 285)

ATIS 'GULF' M2300 8000 76°/66° 150/5

Gusts 22 ALT. 29.54 LNDG 14R.

Relative to gross weights on the data card or FOM - Second Officer

Actual gross weight - not to exceed the structural, performance and runway limits

Transcribed from ATIS

Increments added to the reference speed are used to construct the landing data card.

To determine the reference speed used in card preparation.

To provide information to the Pilots for planning.

Clean maneuvering speed - 198
(reference + 70 kts)
Slat maneuvering speed - 173
(reference + 45 kts)
15 flap maneuvering speed - 163
(reference + 35 kts)
22 flap maneuvering speed - 153
(reference + 25 kts)
35/50 flap approach speeds - 138/133
(ref. + 10/5 kts)
35/50 flap threshold speeds - 133/128
(ref. + 5/reference.)

CLEAN 198 SLAT 173

MAN_{15} 163

MAN_{22} 153

138 $_{W}APP_{35}$ 133

133 $_{W}THRESH_{35}$ 128

REF 128

GW 315.0 (CW 310 305 300 295 290 285)

'-.16' M-2 76°/66°-

Safe clean airspeed for maneuvering

Safe maneuvering speed for slats extended.

Safe maneuvering speed for 15 flaps

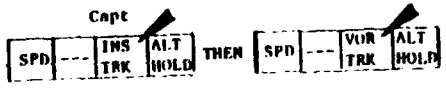
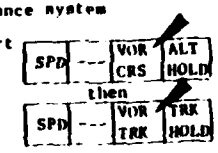
Safe maneuvering speed for 22 flaps.

These speeds plus a wind correction are target approach speeds for 35 & 50 flap settings. Speeds to be maintained across the 'fence'.

Airspeed bugs - set: 1 at 173, 1 at 153 and one at 133. (Capt George is planning a flap 35 landing.)

Data card - Capt and F.O.

Reminds pilots of proper speeds to fly.

DATA	SOURCE	USAGE
CRUISE CON'T		
19:01:00 INS alert light - flashing	Inertial navigation system	Light flashes 2 minutes prior to crossing the next waypoint (Dubuque), to alert the crew.
Change from INS to radio nav.	Capt - F.O.	Anticipation of descent clearance and vectors.
Radio/INS sws - radio	Capt - F.O.	Change course indicators back to magnetic/VOR operation.
NAV mode selector - press	Capt 	Change flight guidance system to radio navigation. (Since the airplane was very close to the selected VOR radial, the system engaged directly into the tracking mode without going into either the armed or capture modes.)
15:05:00 Station passage (Dubuque):		
As when passing Hayes Center:		
The VOR course mode engages,	Flight guidance system	Maintains a steady heading over the zone of confusion.
the new course toward Rockford is set (094°),	Low alt chart 	The auto pilot parallels V-100
the auto pilot parallels, then captures and tracks the outbound 094° radial of DBQ.		Again, with a small change in direction, the tracking mode engages directly.
15:06:30 Descent clearance	Chicago center - First Officer	Begin descent into Chicago.

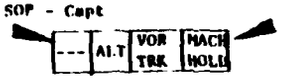
CHICAGO CNTR.: "United two eighty heavy, chicago center."

F.O.: "Chicago, United two eighty, go ahead."

CHICAGO CNTR.: "United two eighty is cleared to descend now to flight level 31.0."

F.O.: "Roger, Chicago. United two eighty is leaving 37.0 for 31.0."

APPROACH DESCENT		
Altitude selector - set to 31,000', the cleared altitude.	Capt - First Officer	Arms the altitude alert system to alert the pilots when approaching the cleared altitude.
	CAPT: "Mike, set and arm 31,000' please."	
	F.O.: "Will do."	
Altitude selector - pull out	F.O. 	Arms the flight guidance system to capture and hold the selected altitude.

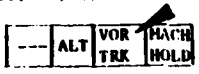
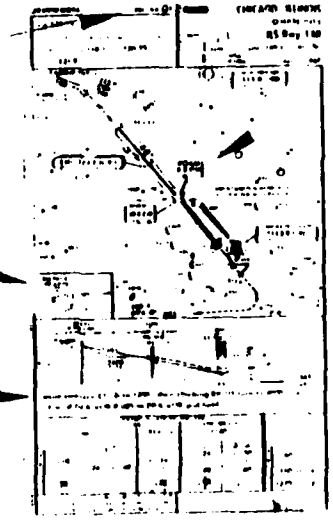
	DATA	SOURCE	USAGE
	APPROACH DESCENT CON'T		
	Auto throttles - disconnect	SOP - Capt	Permits selection of Mach hold. (Interlocks prevent use of auto throttle and IAS or mach hold at the same time, as they conflict.)
	Mach hold - select	SOP - Capt 	Engaging mach hold maintains the mach .830 at which the airplane has been cruising.
15:07:00	Throttles - close	SOP - Capt	Reducing thrust begins the descent because as thrust reduces, the auto pilot will lower the nose to hold the indicated mach (.83)
	Fuel temperature - record in log	SOP - S.O.	Data is for engineering
	Air conditioning and pneumatics	SOP - S.O.	Descent is made with one pack off to reduce air noise. In this case a pack does not have to be turned off as a two pack cruise was used.
	Pressurization - set for landing	SOP - S.O.	Provide proper cabin pressure throughout descent and landing, for passenger comfort and avoid exceeding max differential pressure. (.05 psi)
	Alt set scale - 667'	Approach plate - Second Officer	Verify destination elevation is set. (Was set prior to take off.)
	Baro set scale - 29.54	ATIS - Second Officer	Assures correct cabin alt throughout descent and indg.
	Cabin announcement	Capt - S.O. - PA	Alert cabin crew that descent into Chicago area is starting and relieve passengers minds about high descent rates, cabin floor angles etc.

CAPT: "Matt please announce we are descending and inform the passengers that we may come down rather steeply."

S.O.: "Roger Captain, will do." "Ladies and gentlemen, this is your Second Officer. Captain George has started our descent into Chicago, we anticipate that it may have to be a steep descending path with speed brakes extended. If that is the case please do not be surprised if you notice a change in floor angle or feel a vibration, speed brakes will be the reason. Thank you."

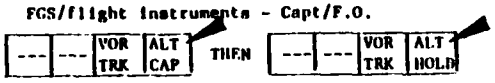
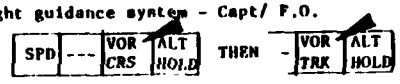
	After 1,000' of descent - cabin vertical speed indicates slightly down	Cabin rate controller - automatic sched.	Will bring cabin elevation to 667' by the time the airplane passes through 11,000'.

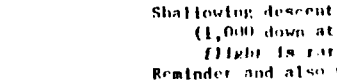
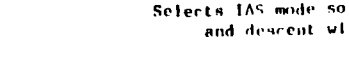
DATA	SOURCE	USAGE
APPROACH DESCENT CON'T		
Hydraulic pump switches - check	SOP - S.O.	Verifies that automatic switching and pump outputs are normal on all six engine driven pumps.
#1 left pump - off #1 left lo press lt - on #1 press - min. 2800 lbs.		
#1 left pump - on #1 lo press lt - out		
#1 right pump - off #1 right lo press lt - on #1 press - min. 2800 lbs.		
#1 right pump - auto #1 right lo press lt - out		
Repeat with #2 pumps		
Repeat with #3 pumps.		
Hydraulic system - set		
Temperature & quantity - normal Annunciator lights - off Motor pump sws - arm	SOP - S.O.	Verify no loss of fluid and temperature normal. Verify system is working properly. Assure that back up hydraulic power is available.
Electrical system - check	SOP - S.O.	Verify system is normal.
Annunciator lights - off CSD temperatures - normal AC loadmeters - less than 1.0 & equal AC bus tie sws - normal DC loadmeters - below 1.0 DC X tie and DC tie sws - open Battery sw - BAT		Verify system is normal. Verify condition of constant speed drives. Verify loads in limits and generators parallel. Verify back up electrical power available. Verify loads in limits. Verify no TR's in parallel. Verify battery is being charged and is avail. for back up power.
Fuel system - set for landing	SOP - S.O.	Verify condition, balance and operation.
Annunciator lights - off All aft tank pumps - on X-feed sws - closed Fuel quantity - in balance Fuel press - normal Fuel used indicators - even		

DATA	SOURCE	USAGE
APPROACH DESCENT CON'T		
Engine and airplane systems - monitor (as in cruise)	Capt - F.O. - S.O.	Verify normal operation.
VOR radios - tune 110.8 (Rockford)	Lo alt. enroute chart - Capt - F.O.	Navigate on V 100 airway to Rockford.
Course selectors - set 098° (inbound course to RFD)	Lo alt. enroute chart - Capt - F.O.	Navigate to RFD.
Annunciators - check		Verify VOR track mode is engaged.
Route from RFD to Chicago - study	Area chart - lo alt. enroute chart - Capt	Situation awareness and planning.
Crew briefing - conduct:	Captain - approach chart	Crew awareness of approach and go around procedure.
CAPT: "Mike - Matt, we have greater than 1,000' and 3 miles, but I like to review the approach plate anyway. I have 21-2, December 81, ORD with 140° inbound. We should cross ROAMY at 6.2 DME, and on glide slope at 2385'. My minimums are 1800 RVR or 1/2 mile with the decision height 864".		Verify up to date information. Verify final approach course. Confirm glide slope height at Final fix. Confirm minimums.
"In case of a miss Mike, remind me that it's straight ahead to 1200', the climbing right turn to 4000' inbound to DuPage on the 085° radial. I'll want 108.4 on my VOR. Okay?"		Review flight path for planning in case of a missed approach
F.O.: "Right Captain, looks like the holding entry will be a left tear drop, if we have to go that far."		
CAPT: "Right Mike, now please tune ROAMY on the ADF, that's 394 - OR."		Identify the final approach fix.
F.O.: "Roger."		
CAPT: "Matt, I'll expect you to call 50', 30' and 10'."		Altitude calls are part of the landing SOP.
S.O.: "Roger Captain, will do."		
ADF 2 - tuned to 394	Approach plate - F.O.	Identify ROAMY
Jack box ADF 2 audio - on (OR)	SOP - F.O.	Identify correct frequency tuned.

	DATA	SOURCE	USAGE
	Approach descent con'T		
	Airspeed - 280 (standard descent speed from about 35,500' down to 10,000')	Airplane instruments	Change over point from MACH hold to IAS hold mode.
	IAS selector - press	SOP - Capt --- ALT VOR TRK MACH HOLD TO VOR TRK IAS HOLD	Auto pilot will now hold 280 knots rather than .83M.
15:10:00	Clearance to Chicago center 138.05	Chicago center - F.O.	Change to next sector controller.
		CHICAGO CNTR: "United two eighty heavy, Chicago, over."	
		F.O.: "Go ahead Chicago, this is United two eighty."	
		CHICAGO CNTR: "United two eighty, change now to Chicago on 138.05, over."	
		F.O.: "Roger, two eighty going to 138.05."	
	VHF radio - tune to 138.05	Freq from Chicago center - F.O.	Initiate contact.
		F.O.: "Chicago center, United two eighty, heavy on 138.05, descending through 32,000' for 31, over."	
		CHICAGO CNTR: "Roger United two eighty, we have you on radar, continue your descent now to 14,000. Cross Rockford at 14,000."	
		F.O.: "Understand cleared to 14,000', United two eighty will cross rockford at 14,000."	
	Altitude selector - reset to 14,000'	SOP - F.O.	Re-arm altitude alert system for 14,000'
	Altitude selector - pull out	SOP - F.O.	Arm flight guidance system to Capture 14,000.
	Increase descent rate:		
		F.O.: "Captain, we are to cross Rockford at 14,000' and it is less than 5 minutes ahead. We have about 17,000' to lose."	
		CAPT: " Thanks Mike, I'd better increase the descent rate a bit."	
	Speed brake handle - set to 2/3	SOP - Capt	Increase drag so that the auto pilot will lower the nose to hold the indicated speed, increasing the descent rate.
	Gate information - request	SOP - Chicago ramp - S.O.	Planning info for after landing and connection info for convenience of the passengers.
	ACARS VOX mode - select	SOP - Second Officer	Enable voice communication.
	VHF radio 2 - tune to 129.3	FOM - Second Officer	Contact Chicago ramp.

DATA	SOURCE	USAGE
APPROACH DESCENT CON"T		
	S.O.: "Chicago, United two eighty, go ahead."	
	CHICAGO RAMP: "United two eighty this is Chicago, go ahead."	
	S.O.: "Roger chicago, two eighty would like connections and gate assignment. Also be advised we need two wheel chairs to meet the airplane."	
	CHICAGO RAMP: "Roger, understand two eighty needs two wheel chairs; we'll have them for you. Your gate is E 11 W, stand by for connections."	
Passing 18,000' - runway turnoff lts - on	FAR - FOM - Capt	Regulation designed to make aircraft more visible.
Altimeters - set 29.54	ATIS - S.O.	Maintain proper elevation throughout approach and accurate altitude information for landing.
Rate of descent - reduce:		
Speed brake handle - retract	SOP - Capt	Auto pilot will reduce vertical speed to maintain indicated airspeed as drag decreases.
Connection information	Chicago ramp - S.O.	Passenger information.
	CHICAGO RAMP: "United two eighty, chicago with connections."	
	S.O.: "Roger chicago, go ready to copy."	
	CHICAGO RAMP: "Two eighty, Boston - E6, Cleveland - E4, Detroit - F5, New york - F9, Miami - E3A, Newark - F6 and Philadelphia - F7, did you copy?"	
	S.O.: "Roger Chicago copied all okay, thanks."	
Forward attendant call sw - press (after picking up the hand set)	Second Officer - First flight attendant	Signal at forward attendant's station
	FFA: "This is the first flight attendant, what do you need?"	
	S.O.: "We're okay, I have some gate connections."	
	FFA: "All right, be right up to get them."	
Cockpit door signal - 2 raps	As briefed by the Captain	Access to cockpit from cabin by attendant.
	FFA: "Can I get the connections?"	
	S.O.: "Right, here you are, I asked for the two wheelchairs also."	
	FFA: "Thanks. We are all okay in the back, we've finished serving and have the equipment stowed."	
ACARS - select DATA mode	SOP - S.O.	Return to normal radio watch

	DATA	SOURCE	USAGE
	APPROACH DESCENT CON'T		
	Altitude alert light - on	Air data computer - Capt/F.O.	Alerts pilots that selected altitude is being reached.
	14,000' altitude	FGS/flight instruments - Capt/F.O.	Annunciators show capture of selected altitude.
	Altitude alert light - out		Within 200' of selected altitude.
	Auto throttles - on, speed selector - 280	SOP - Capt 	Auto throttles will maintain speed during level off.
15:17:30	Station passage - Rockford	Flight guidance system - Capt/F.O. course deviation bar - swings to/from indicator - swings RMI VOR pointers - swing	Navigation
	VOR course mode - engages	Flight guidance system - Capt/ F.O.	Maintains a heading parallel to track over the zone of confusion.
	VOR track mode - re-engages		
	Clearance to descend and vectors	Chicago center - Capt & F.O.	Enter into traffic for approach at Chicago and spacing for traffic.
		CHICAGO CNTR.: "United two eighty heavy, Chicago."	
		F.O.: "Go ahead Chicago, this is United two eighty heavy."	
		CHICAGO CNTR.: "You are cleared to descend to 8,000'. Now steer left to 080° vectors for approach."	
15:18:00		F.O.: "Roger understand United two eighty is cleared to 8,000'. We are steering left to 080°."	
	Auto throttle - off	SOP - Capt	Preparation for descent.
	IAS - select	SOP - Capt	Auto pilot will maintain speed with pitch.
	Throttles - closed	SOP - Capt	With throttles closed and auto pilot in IAS hold, the airplane will descend as before.
	Altitude select - 8,000'/pull to arm		Provide altitude alert and capture.
	Heading selector - set 080°/pull to arm		Auto pilot will steer the air plane to the selected heading and maintain it.

DATA	SOURCE	USAGE
APPROACH DESCENT CON'T		
Passing 12,000' - slow to 250 kts	SOP - Capt	Maximum speed below 10,000'.
Vertical speed selector - 1,000' dn	SOP - Capt 	Shallowing descent causes airplane to reduce speed. (1,000 down at 12,000 works out so that level flight is rarely necessary.) Reminder and also will set auto throttles to hold this speed after level off.
Speed selector - set to 250	SOP - Capt	
Passing 10,000' & reaching 250 kts - IAS switch - press	SOP - Capt 	Selects IAS mode so that auto pilot will hold 250 kts and descent will continue.
15:21:08 Approach descent check list	SOP - Capt - S.O.	Verify required descent items are completed.

CAPT: "Matt, will you complete the descent check list- please?"

S.O.: "In progress Captain."

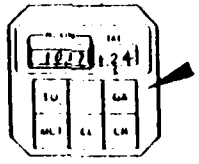
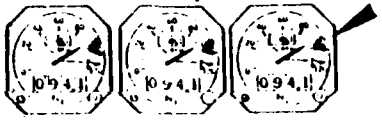
APPROACH DESCENT CHECKLIST

(To be checked and announced when completed by the Second Officer)

HYDRAULICS	-	CHECKED, MOTOR PUMPS & RUDDER STANDBY POWER ARMED
ELECTRICAL	-	CHECKED
FUEL	-	CHECKED, ALL AFT TANK PUMPS ON
PNEUMATICS & AIR CONDITIONING	-	CHECKED
PRESSURIZATION	-	SET
AIRSPEED BUGS	-	SET
ALTIMETERS	-	SET
THRUST COMPUTER	-	GA
RADIO/INS SWITCH	-	RADIO
SEAT POWER OFF	-	OFF
SEAT BELT SIGN	-	ON
NO SMOKING SIGN	-	ON

S.O.: "Approach descent checklist is complete except for go around on the thrust computer and seat belt and no smoking signs not on."

15:21:51 CAPT: "Thanks Matt, turn the signs on and belt them in."

DATA	SOURCE	USAGE
APPROACH DESCENT CON'T		
Seat belt and no smoking sws - on	Second Officer	Alerts the cabin attendants and passengers that the flight is approaching destination.
Cabin announcement	Second Officer	Backs up the cabin signs.
Hand set/PA switch:		
	S.O.: "Ladies and gentlemen Captain George has turned on the seat belt signs as we are approaching our destination, and will be starting our landing approach in a few minutes."	
Thrust computer - go around	SOP - F.O. 	Sets a limit on engine thrust in the event of a missed approach. (The thrust computer sets it's limit based on temperature, pressure altitude, engine bleed conditions and the selector button pushed.)
N1 limit bugs - set	Automatic - thrust computer 	Auto throttles will not advance past these bugs.
	S.O.: "Approach descent checklist complete."	
Altitude alert light on	Automatic - altitude alert system	Alerts pilots that they are approaching the selected altitude.
Altitude 8,000' - Altitude capture	Automatic - FCS (autopilot)	Auto pilot captures and holds assigned (selected) alt.
Auto throttles - on	SOP - Capt 	The auto throttles will maintain the 250 knot speed previously selected.

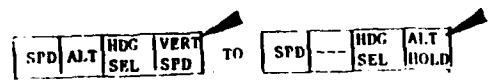
15:23:00 Clearance to approach control:

CHICAGO CNTR.: "United two eighty heavy, change now to Chicago approach on 119.8."

F.O.: "Roger Chicago, United two eighty going to approach on 119.8."

DATA	SOURCE	USAGE
APPROACH DESCENT CON'T		
VHF com 1 - tune to 119.8	Freq from Chicago center - F.O.	Initial contact.
	F.O.: "Chicago approach this is United two eighty heavy, on 119.8, 8,000', heading 080°, go ahead."	
	CHICAGO APPROACH: "United two eighty heavy, Chicago approach, we have you on radar, Descend now to 7,000'."	
	F.O.: "Roger, two eighty is leaving 8 for 7."	
Altitude selector - set & arm 7,000'	SOP - First Officer	Set FGS to capture and hold 7,000'.
Vertical speed selector - 1,000 FPM down	SOP - Capt	Auto pilot will descend the airplane at 1,000 feet per minute down, while the auto throttle keeps the airspeed constant.
Altitude 7,000 - Alert light, capture & altitude hold as before.	Automatic	Auto pilot levels at selected altitude and the auto throttle holds the selected speed.
15:27:30 Speed reduction to 180 knots	Chicago approach	Traffic control
	CHICAGO APPROACH: "United two eighty, reduce now to 180 knots."	
	F.O.: "Roger Chicago understand slow to 180." "Capt George did you copy?"	
	CAPT: "Right Mike, please set speed 180, and extend the slats."	
Speed selector - set 180	First Officer	Throttles will slow the airplane to 180 kts.
Flap/slat handle - set to zero/ext	First Officer	Slats are required at this weight to reduce below Clean maneuvering speed.
	F.O.: "Slats extend - speed 180."	
Slat indicator lights - Disagree on, then off and take off light on.	Flap/slat position indicator - F.O.	Verify slats extended to the take off position.
Clean maneuvering speed - 198 kts	Landing data card	Safe speed for maneuvering.
Landing gear warning horn - sounds along with red ind. lights	Automatic - gear warning system	The throttles closed to decelerate to 180, causing the red gear warning lights to come on. As speed reduced below 215 knots ind. airspeed, the aural warning sounds to alert the crew.
Gear horn off button - press	SOP - S.O.(or F.O.)	Silences the aural warning and resets the system.

DATA	SOURCE	USAGE
APPROACH DESCENT CON'T		
	F.O.: "Captain George are you ready for the landing gear?"	
	CAPT: "Let's hold the gear for a few minutes yet. If we use 35 flaps for landing, instead of 50, it will save 145 pounds of fuel and only use up about 240' of runway, and every minute we wait on gear extension will save about 100 pounds." (Flight Handbook - training and reference.)	
RADAR vectors for approach:		
15:29:10	CHICAGO APPROACH: "United two eighty steer left to 140°."	
	F.O.: "Roger United two eighty steering left to 140°."	
Heading selector - 140	SOP - F.O.	Auto pilot turns the airplane to 140°. (It is not necessary to pull out the selector knob in this case as the system is already in the HDG SEL mode)
FINAL APPROACH AND LANDING		
RADAR vector for approach:		
15:31:00	CHICAGO APPROACH: "United two eighty, steer left to 190°, expect further descent and base leg in about 5 miles."	
	F.O.: "Roger, Chicago, United two eighty - left to 190°."	
Heading selector - 190	SOP - F.O.	Auto pilot turns airplane to 190°, in the heading select mode.
VOR 1 - tuned to 109.7 Chicago 14R ILS	Approach plate (freq) - Capt	Prepare for ILS approach.
Course selector 1 - set to 140°	Approach plate - Capt	Set ILS final approach course.
	CAPT: "Mike I'm on the ILS frequency and I'd like you to tune ORD so we'll have DME until passing ROAMY."	
	F.O.: "Roger."	
VOR 2 - tuned to 113.9 ORD VOR	Approach plate - F.O.	To recieve DME information during approach to identify SEXXY and ROAMY Intersections.
Ignition selector - continuous B	SOP - S.O.	To furnish ignition in the event of a go around.
3.2 ev	Maneuvering flaps:	
	CAPT: "Flaps 15, speed 163."	
	F.O.: "Roger, flaps 15, speed 163."	

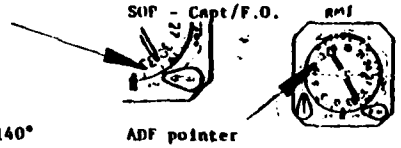
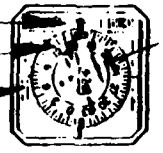
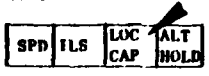
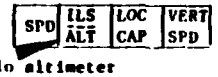
DATA	SOURCE	USAGE
FINAL APPROACH AND LANDING CON'T		
Speed brake lever - retract	SOP - F.O.	Verify speed brakes are retracted prior to selecting flaps. (Speed brakes and flaps are not to be used together.
Flap handle - position 15	SOP - F.O.	Extend flaps for maneuvering.
Flap indicator tapes - 15	Flap indicator - F.O.	Verify flaps moved to selected position.
Speed selector - 163 knots	Landing data card - Capt - F.O.	Throttles will slow airplane to 15 flap maneuvering airspeed.
RADAR vector/descent clearance:		
15:32:05 CHICAGO APPROACH: "United two eighty turn right to 250° and descend to 5,000', this is your base leg."		
F.O.: "Roger, United two eighty steering right to 250° for base leg and descending to 5,000'."		
Altitude selector - 5,000 set & arm	SOP - First Officer	Set FGS to capture and hold 5,000"
Vertical speed selector - 1,000 FPM down	SOP - Capt 	Auto pilot will descend the airplane while the auto throttles maintain 163 knots.
Altitude 5,000' - alert light, capture and hold as before.		Auto pilot levels at the selected altitude.
Maneuvering flaps:		
CAPT: "Flaps - 22, speed 153."		
F.O.: "Roger flaps 22, speed 153."		
Flap handle - position 22	Flap indicator - F.O.	Extend flaps to reduce maneuvering safe speed.
Flap indicator tapes - 22	Flap indicator - F.O.	Verify flaps moved to selected position.
Speed selector - 153	Landing data card - Capt - F.O.	Throttles will further slow the airplane.
15:33:50 RADAR vector to intercept heading:		
CHICAGO APPROACH: "United two eighty, turn left to 170°. This is your intercept heading, you are cleared for ILS approach to 14 right. Cross SEXXY intercection at 4,000', contact the tower on 118.1 over ROAMY."		
F.O.: "Roger two eighty turning to 170°, cleared for approach, cross SEXXY at 4,000, tower on 118.1 at ROAMY."		

	DATA	SOURCE	USAGE
	FINAL DESCENT AND LANDING CON'T		
	Heading selector - 170	RADAR vector - F.O.	Auto pilot will turn the airplane to 170°.
	Altitude selector - 4000 set and arm	Approach control - F.O.	Set FCS to capture and hold 4,000'.
	Vertical speed selector - 1,000 FPM down	SOP - Capt	Auto pilot will descend the airplane at 1,000 FPM.
	Altitude alert light - on	Automatic - Alt alert system	Alerts pilots as airplane nears level off altitude.
	Altitude 4,000' - Alt captured and held	Automatic - FCS	Auto pilot levels off and changes to alt hold mode.
	ILS mode selector - press	SOP - Capt	To arm the flight guidance system to capture and track both the localizer and the glide slope.
			
	Landing configuration:		
15:35:22		CAPT: "Gear down, final descent checklist."	
		F.O.: "Roger, gear down."	
	Gear handle - down	Capt - F.O.	Extends the gear.
	Gear indicator lights - 3 green	Gear indicators	Verifies the gear is locked in the down position.
	Brake pressure - normal	Brake press gages - F.O.	Verifies brake availability.
	Spoiler handle - raise	SOP - F.O.	Arms spoilers for automatic deployment on touch down.
15:35:47	Final descent checklist	Cockpit card	Read by Second Officer - responded to by appropriate crew member. Verify safety items complete.

FINAL DESCENT CHECKLIST

CHALLENGE (S/O)		RESPONSE
IGNITION	-	CONTINUOUS (F/O)
FLIGHT & NAV INSTRUMENTS	-	CROSS CHECKED NO FLAGS (F/O)
GEAR	-	DOWN, THREE GREEN (F/O)
FLAPS	-	22__, TAKEOFF LIGHT (F/O)
BRAKE PRESSURE	-	NORMAL (F/O)
SPOILERS	-	ARMED (F/O)
ANNUNCIATOR LIGHTS	-	CHECKED (F/O,S/O)

15:36:04 S.O.: "Checklist complete."

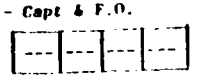
DATA	SOURCE	USAGE
FINAL APPROACH AND LANDING CON'T		
ILS approach:		
#2 ADF/VOR selectors - ADF	SOP - Capt/F.O. 	Verify passage of ROAMY locator, and compare bearing with ILS course.
Bearing to ROAMY - nearing 140°	ADF pointer	Indicates nearing approach course.
Course indicator shows: Heading - 170° ILS course - 140° Course bar - moving in 		Indicates nearing approach course.
	CAPT: "The course bar is off the peg. Let me know when we pass SEXXY."	
	F.O.: "Right, that'll be 14 miles on the DME."	
15:36:17 Localizer capture mode - engages	Automatic - FGS 	Auto pilot turns the airplane to intercept and track the localizer.
14 miles from ORD (SEXXY int.)	DME tuned to ORD - F.O.	Identify position.
Vertical speed wheel - 1,000 FPM down	SOP - Capt	Initiate descent to approach altitude.
	CAPT: "Set and arm 2400'."	
	F.O.: "Roger 2400'"	
Altitude selector - 2400' & pull out	Capt - F.O. (altitude from the approach plate) 	Arms FGS so that auto pilot will capture the selected altitude. Auto throttle will continue to hold the selected 22 flap speed (153)
Radio altitude - passing below 2,500'	Radio altimeter	Alerts crew to flight situation.
Decision height lights on	Capt & F.O.	Press to extinguish and rearm.
Localizer track mode - engages	Automatic - FGS (cannot engage in track until below 2,500' radio altitude) 	Auto pilot will track the localizer to the runway.

DATA	SOURCE	USAGE
FINAL APPROACH AND LANDING CON'T		
Altitude - 2,400'	Altimeter - Flight guidance system SPD | ILS | LOC TRK | ALT HOLD	Automatic capture of the selected altitude.
Glide slope pointer - nearing center	Course indicator - Capt & F.O. 	Indicates that flight is approaching the glide slope.
VHF comm 1 - tune to 118.1 (ORD tower)	Chicago approach/approach plate - F.O.	Prepare for tower contact at ROAMY.
Landing flap setting - 35	SOP - Capt & F.O.	Slow to approach speed and set landing configuration.
Target approach speed - set (Threshold speed plus 1/2 the steady wind velocity and the full gust factor, not to exceed 15 knots. [15 gusts to 22] 133 + 8 + 7 = 148 knots)	SOP/flight handbook/landing data card - Capt & F.O.	Set minimum safe speed for wind and weight conditions.
	CAPT: "Flaps - 35, speed 148. I have the runway in sight, but will continue on auto pilot."	
	F.O.: "Roger, 35, speed 148."	
15:37:50 Flap handle - position 35	F.O.	Select landing flaps.
Flap tapes - 35, Slat land lt - on	Flap indicator - F.O.	Verify flaps & slats have moved to selected position.
Speed selector - 148	F.O.	Set auto throttle system to maintain target approach speed.
Glide slope capture mode - engages and approach only annunciates.	Flight guidance system SPD | APP ONLY | LOC TRK | GS CAP	Auto pilot maneuvers to capture the glide slope and track it to the runway. Approach only is a reminder that the auto land is not armed and a manual landing must be made.
Glide slope track mode - engages	Flight guidance system SPD | APP ONLY | LOC TRK | GS TRK	Auto pilot will now keep the airplane on the glide slope, while the auto throttle maintains target approach speed.
Crossing ROAMY:		
ADF needle swings to tail	RMI/ADF - F.O.	Indicates station passage.
Marker beacon - light & tone	Marker light panel/radio - F.O.	Indicates station passage.

	DATA	SOURCE	USAGE
	FINAL APPROACH AND LANDING CON'T		
	Final approach fix and target speed - call.	SOP - Capt	Verbal identification of the fix and speed to assure cross check by other crew members, and make sure the command speed bug is set.
		CAPT: "ROAMY - my target approach speed is 148 knots."	
	Altitude - 2385'	Altimeter/approach plate - Second Officer	Verification of glide path height at the final approach fix.
	Flight instruments and radios - monitor	SOP - S.O.	Verify any discrepancy or evidence of destabilization.
	Tower contact - landing clearance	F.O.	Get landing clearance.
		F.O.: "Chicago tower, United two eighty heavy, ROAMY, go ahead."	
15:38:08		CHICAGO TOWER: "Roger, United two eighty heavy is cleared to land on 14 right. Wind is 150° at 15 knots with gusts to 22."	
		F.O.: "Roger, United two eighty cleared to land."	
	#2 VOR - tuned to 109.7	Approach plate - F.O.	Provides a back up ILS indication for the system already in use, and permits the First Officer to monitor the approach.
	Altitude - 1000' above grnd level - instrument check and call out and response, announcing the minimums.	SOP - First Officer & Captain & S.O.	Verify that all instruments are in agreement between left and right systems and get a response to make sure no subtle incapacitation of the Captain has occurred.
		F.O.: "1,000', instruments cross check."	
		CAPT: "Going to 867' barometric."	
15:38:55	Altitude - 500' above grnd level - cross check and final flap setting response.	SOP - First Officer & Captain & S.O.	Verify flap setting, planned reference speeds and check against incapacitation.
	Altitude - 967' (100' above min) approaching minimums call	SOP - Second Officer	Alert the Captain that he is nearing minimum alt.
	Altitude - 867' (minimums) call	SOP - Second Officer	Inform Captain that minimum altitude has been reached.
	NOTE: Preceeding two calls might not be required in the event of visual approach conditions.		
	At or before 62' above ground - Autopilot disengage sw. - press, once to disengage, once to put out the warning lights.	SOP - Capt	Coupled approaches are not to be conducted below 62' in DC-10 airplanes without auto land in use.

	DATA	SOURCE	USAGE
	FINAL APPROACH AND LANDING CON'T		
	Radio altitude 50' - auto throttles retard	Auto throttle/speed control system	Reduce thrust automatically for the landing.
	Altitude call outs just prior to touch down at 50, 30 & 10 feet	Radio altimeter/SOP - S.O.	Assist the Captain in judging flare.
15:40:00	Touchdown:		
	Throttles - idle	Auto throttle system/rear wheel spin-up - Capt	Throttles close to allow deceleration.
	Spoilers - extend	Auto-spoiler system - S.O.	Assist in deceleration. (Monitored by the S.O.)
	Ground shift - nose strut compression:	Capt lowers nose wheel to runway	Switches several systems to ground operation.
	Throttles - gnd idle	Automatic	Permits lower idle for deceleration.
	Outflow valve - open	Automatic/pressure controller	Depressurizes cabin.
	#2 throttle revers interlock - release	Automatic	Permits reverse operation of #2 engine.
	Pitot heat - reduces	Automatic	Prevents over heat on the ground
15:40 +	On time - transmitted	ACARS	Radios on time to ARINC which passes info to UNIMATIC for flight following, airplane flight time, crew flight time etc.
	Landing gear handle - latch	Mechanical linkage	Prevent inadvertent gear retraction.
	Wing anti-ice - deactivates (turns off, if on.	Automatic	Prevent over heat of slat anti-ice system.
	Throttles - lift to reverse	Capt	Assist in deceleration.
	Brakes - apply	Capt	Deceleration.
	Reverse indicator lights - Reverse unlock - on/off & reverse thrust light - on	Reverse mechanism position - S.O.	Monitor reverser operation. (S.O. informs Captain of any abnormal indication.
	Engine indications - in limits	SOP - S.O.	Prevent over temp or over boost.
	Throttles - forward thrust (prior to going below 60 kts)	SOP - Capt	Taxi to ramp.
	Reverse indicator lights - reverse unlock - on/off & reverse thrust light - off	SOP - Capt/S.O.	Verify forward thrust.

DATA	SOURCE	USAGE
FINAL APPROACH AND LANDING CON'T		
Flight director switches - off	SOP - Capt & F.O.	Clear the annunciators and turn off the system.



15:41:00 Clearance to ground control:

CHICAGO TOWER: "United two eighty, clear the runway to the left when able, change to ground control on 121.9."

TAXI IN AND PARK		
Anti skid switch - off	SOP - Capt	Prevents loss of brakes in the event of a faulty ground shift mechanism.
Anti skid fail annunciator lights - on	Annunciator panel - Capt	Verifies that the anti skid system is off.
Spoiler handle - push down	SOP - Capt	To retract the spoilers.
Spoiler handle - moves to retract position	Automatic	Retracts splrs to clear evac route if needed.
Spoiler tapes - zero	Flight control position indicator - Capt	Verifies spoilers retracted.
Flaps - retract	Capt - F.O. (on command)	Flaps are retracted to preclude damage from debris which might be thrown up by the wheels. (only to position 22 if snow or slush are present)

CAPT: "Flaps - up."

	F.O.	To retract the flaps and slats.
Flap handle - Up	Flap/slat position indicator - F.O.	Verify flaps have retracted.
Flap tapes - zero	Flap/slat position indicator - F.O.	Verify slats have retracted.
Slat indicator lights - disagree then out	Chicago ramp - S.O.	Confirm gate position.
Gate confirmation	S.O.	Return VHF com 2 to voice operation.
ACARS vox mode - select		

S.O.: "Chicago ramp, United two eighty is on the ground requesting confirmation of gate E 11 west."

CHICAGO RAMP: "Roger two eighty, gate E 11 west is confirmed, your wheel chairs are waiting."

15:41:30

S.O.: "Captain, we have gate E 11 west still."

	S.O.	Return to data mode for normal operation.
ACARS data mode - select	Tower/approach page - F.O.	Contact ground control.
VHF com 1 radio - 121.9		

F.O.: "Chicago, United two eighty heavy on 121.9"

	DATA	SOURCE	USAGE
	TAXI IN AND PARK CON'T		
		CHICAGO GROUND: "United two eighty left at the next high speed - hold short of the outer taxiway."	
		F.O.: "Roger Chicago, two eighty will clear left at the next turn off."	
	Brake pressure - normal	Sys 1 & 2 brake press gages - F.O. & S.O.	Confirm pressure to assure adequate braking.
15:42:00	APU start:	SOP - S.O.	Prepare to furnish electrical and pneumatic power so engines may be shut down at the gate.
	APU oil quantity - 4 qts min	APU control panel/flight handbook limits - S.O.	4 qts minimum is required for APU operation prior to starting. (Any amount above zero is okay after the APU is running.)
	APU master switch - run	SOP - S.O.	Opens APU inlet door.
	APU door open light - on	S.O.'s annunciator light panel - S.O.	Verifies that door has opened.
	Master switch - Momentarily to run, then release to run	SOP - S.O.	Begins APU starting cycle.
	APU oil press lo and generator off lights come on	APU control panel - S.O.	Normal starting cycle indications.
	N_1, N_2 & Exhaust temp inds - increase to operating ranges	APU control panel - S.O.	Normal starting and operating indications.
	APU oil pressure lo light - off	APU control panel - S.O.	Confirms adequate oil pressure for operation.
	APU gen off light - out	APU control panel - S.O.	Confirms generator is operating satisfactorily.
	APU power avail lt - on	APU control panel - S.O.	Confirms generator volts and frequencies normal.
	APU gen bus sws 1,2 & 3 - on	SOP S.O.	APU generator will now power airplane gen buses automatically as the engines are shut down.
	Galley power and coffee bar sws - off	SOP - S.O.	Reduce unnecessary electrical loads, and shut down unnecessary equipment.
	Cabin outflow valve - full open	Valve position ind - S.O.	Verifies cabin has depressurized.
	Cabin vertical speed - zero and cabin altitude 667' (field elevation)	Cabin press. control panel - S.O.	Verifies cabin has depressurized.
	Log book entries	S.O.	Information for maintenance for airplane/engine hist.

	DATA	SOURCE	USAGE
	TAXI IN AND PARK CON'T		
	HF radio sws - off	SOP - F.O.	Turn off, if on, to reduce operating time.
	Windshield anti-ice and de-fog sws - off	SOP - F.O.	Allow to cool.
	Pitot heat selector - off	SOP - F.O.	Allow to cool.
	Engine anti ice sws - off	SOP - F.O.	Turn system off if on.
	DME 1 & 2 - standby	SOP - F.O.	System has no off switch position so DME's are placed in standby which is a warm up mode.
	Radar - standby	SOP - F.O.	Same as DME.
	Transponder - stand by	SOP - F.O.	Same as DME.
	Rudder standby power - off	SOP - S.O.	Prevents unnecessary operation and wear during engine shut down which causes changes in hyd. pressure.
	Airspeed - at safe taxi speed	Captain	Taxi to ramp through congested areas.
	Hydraulic motor-pumps - off	SOP - S.O.	Prevent unnecessary operation and wear during engine shut down.
15:42:30	Turning off the runway:	Captain	Taxiing toward the ramp.
	Center engine - shut down	Captain & Second Officer	Save fuel and engine wear.
	CAPT: "Matt, can I shut down #2?"		
	Max temp in reverse - less than 750°c	Hand book - Capt & S.O.	Engine cooling requirement.
	Out of reverse - 1 min or more	Hand book - Capt & S.O.	Engine cooling requirement.
	APU elec gen bus sws - on	S.O.	Ready for engine 2 shut down.
	S.O.: "Roger ready for #2 engine shut down."		
	CAPT: "Cut #2."		
15:43:00	Fuel lever - off	Capt - F.O.	Shuts down the number two engine.
	Taxi obstruction:	Visual	Causes slowing or stopping.
	F.O.: "Captain watch that 727 on the outer taxi way he's blocking our path."		
	Brakes - on/throttles closed	Capt	Stopping until obstruction clears.
	CHICAGO GROUND: "American four twenty, please pull ahead you are blocking the taxi way."		
	AMERICAN 420: "Will do, sorry."		

DATA	SOURCE	USAGE

TAXI IN AND PARK CON'T

CHICAGO GROUND: "United is clear across the outer."

F.O.: "Two eighty, roger."

15:45:00 Ramp traffic:

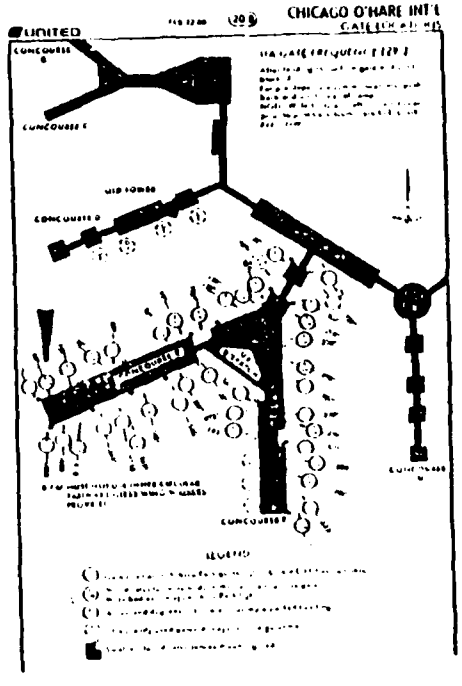
F.O.: "Captain George do you see the truck coming from your left?"

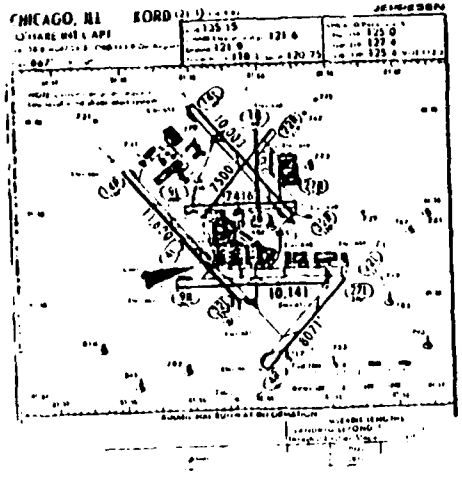
CAPT: "Roger I've got him in sight, he's stopping."

Gate location:

CAPT: "Let me have a look at that gate chart, I think E 11 W is just over to the right as we come on to the ramp here."

F.O.: "Thats correct, and there is someone out there in place."





Turn off pofat to ramp.

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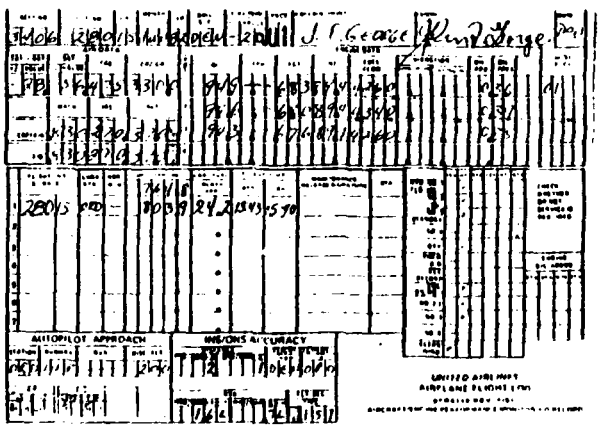
DATA	SOURCE	USAGE
TAXI IN AND PARK CON'T		
Accu-park:		
Red and green neon lead in lights	Visual - Capt	Provide the Captain with a visual reference as he taxies in to the gate so that the airplane will be properly lined up with the gate.
Red neon lights located off to the side	Visual - Capt	Provide the Captain with a visual reference for stopping.
15:45:?? Brake pedals - depress and hold	SOP - Capt	To set the parking brakes.
Parking brake lever - pull aft	SOP - Capt	To set the parking brakes.
Brake pedals - release	SOP - Capt	
Park brake ind lights - on	Annunciator panel & pedestal - Capt	Verify brakes are set.
Seat belt sign - off	SOP - Capt or F.O.	Let passengers prepare to deplane.
Stabilizer trim handles - hold toward nose down until trim ind reaches the top of the green band.	SOP - Capt or F.O.	Position the stabilizer to the park position which prevents possible foreign material from getting in the mechanism.
Engine bleed switches - off	SOP - S.O.	Preparation for shutting down the engines.
INS 1 & 2 waypoint change sws - press	SOP - Capt	Preparation for shutting down the INS.
Waypoints 1 & 9 - key in	SOP - Capt	Preparation for reading distance error for the log.
Data selectors - dis/time	SOP - Capt	Read distance for the log.
Displays show - #1, 2NM & #2, 1NM	SOP - Capt	Compare with limit, must be written up if over 25 NM.
Data selectors - XTK/TKE	SOP - Capt	Read Cross track distance and write up if over 25 NM.
INS 1 & 2 mode selectors - off	SOP - Capt	Turn off the INS equipment.
Engine shut down:	SOP - Capt & S.O.	Preparation for leaving airplane
	CAPT: "Matt are you ready for engine shut down?"	
	S.O.: "Roger, Captain, they have idled long enough for cooling and I have the APU generator on tap."	
	CAPT: "Okay shut them down."	
15:46:?? Fuel levers 1 & 3 - off	F.O.	Shuts off the engines.
APU 1 & 3 power in use lights - on	S.O.	Confirms that APU generator has powered the electrical system.

	DATA	SOURCE	USAGE
	TAXI IN AND PARK CON'T		
	Emergency light switch - off	SOP - Capt	Disarms the automatic emergency light system to prevent inadvertent discharge of the batteries.
	Pack switches - on	SOP - S.O.	Switches checked in the on position to continue air conditioning from the APU pneumatic air.
	1-2 & 1-3 isolation valve sws - normal	SOP - S.O.	Valves will operate from the APU isoltion valve switch
	APU isolation valve switch - open (after engine shut down to preclude engine fumes entering the cabin air)	SOP - S.O.	Opens the APU isolation valve to allow air from the APU compressor to enter number two pneumatic system and also opens the 1-2 & 1-3 isolation valves so the air can pressurize 1 & 3 systems as well.
	Fuel tank pump sws - off except #2 rt aft	SOP - S.O.	One pump in #2 tank is required to operate the APU.
	Cabin door lights - check on	SOP - S.O.	Confirms that the escape slides in the doors have been disarmed.
15:46:50	ACARS data mode - select	SOP - S.O.	Prepare to enter fuel and landing data.
	Fuel/lndg key - press	SOP - S.O.	Prepare to enter fuel and landing data.
	Fuel/lndg key light - on & display shows FO (fuel on board)	Visual - S.O.	Verifies set is ready to accept information.
	Key in 242 (24,200#) - display shows 242	Fuel quantity indicators, fuel remaining	Numbers in the window verify correct info has been entered.
	Enter key - press	SOP - S.O.	Enters data and clears the display.
	Display - shows LA	Visual - S.O.	Indicates ACARS is ready to accept pilot at the controls for landing information.
	Key in 1 (Captain) - display shows 1	SOP - S.O.	Verify 1 has been selected.
	Enter key - press, fuel/lndg key light - out	SOP - S.O.	Information is now ready to send.
	Send key - press.	SOP - S.O.	ACARS transmits in time as well. In time is recorded when the brakes are set and doors 1 or 2 left are opened.

DATA	SOURCE	USAGE
TAXI IN AND PARK CON'T		
Parking checklist	Cockpit card	Read by First Officer - responded to by appropriate crew member.

PARKING CHECKLIST

CHALLENGE (F/O)		RESPONSE
PARKING BRAKE	-	SET (C)
RADAR	-	OFF (C)
TRANSPONDER	-	STANDBY (C)
SPOILERS & FLAPS	-	RETRACTED (C)
FUEL LEVERS	-	OFF (C)
EMERGENCY LIGHT SWITCH	-	OFF (C)
IGNITION	-	OFF (C)
HF RADIOS	-	OFF (C)
INS	-	OFF (C)
PITOT HEAT	-	OFF (C)
MOTOR PUMPS & AUX PUMPS	-	OFF (S/O)
RUDDER STANDBY POWER	-	OFF (S/O)
AIR CONDITIONING	-	CHECKED (S/O)
TANK PUMPS	-	OFF (EXCEPT ONE FOR APU) (S/O)
CABIN DOOR ANNUNC. LIGHTS	-	ALL ON (S/O)
WINDSHIELD ANTI-ICE/DEFOG	-	OFF (C)
BATTERY SWITCH	-	ON (APU RUNNING) (S/O)

DATA		SOURCE	USAGE
TAXI IN AND PARK CON'T			
	Cockpit and exterior lights - off	SOP - Capt - F.O. - S.O.	Reduces heat and prolongs life of panels and lights.
	APU shut down:		
	External power available light - on	Visual - S.O.	Indicates external power is available and acceptable.
	External power switch - on	SOP - S.O.	Powers the tie bus, so that the APU can be shut down.
	APU isolation valve switch - close	SOP - S.O.	Starts the 90 second enforced idle before the APU will shut down and unloads it pneumatically for cooling.
	APU generator bus sws - off	SOP - S.O.	Unloads the APU electrically.
	APU power in use lights and the AC bus tie isolate lights - out	Visual - S.O.	Verifies that External power is now powering the buses.
	APU master switch - off	SOP - S.O.	Shuts down the APU unless the 90 second timer has not run out. A. will shut down at the end of the time.
	Yellow capped circuit breakers - pull	SOP - S.O.	Yellow caps identify breakers that are used to un-power certain equipment such as electronics so they will not stay operating and hot when not needed.
	Log book completed		All data recorded and ready for the Captain's signature
15:49:00	Log book signed		
15:50:00	Crew departs the airplane.		

DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
1. Departure time.	12 05 00						
2. Departure station. (DEN)							AFPAM, dispatch release message & weather briefing message-deliver 1 hr 30 min prior to flight.
3. Arrival time.							
4. Destination. (ORD)							
5. Aircraft route.							
6. Airplane number.							
7. Crew selection.							
8. Weather.							
9. Flight plan forecast.							
10. Weather briefing message.							
11. Dispatch release message.							
12. Planned fuel. (52,600#)		12 06 00	01 00				
13. Actual gross weight. (343,000#)			--				Crew reports.
14. Crew reporting time. (12:35)	12 35 00						
15. Notices to airmen.	12 35 30	12 36 30	01 00	1	1	1	
16. Field conditions.	12 36 30	12 37 30	01 00	1	1	1	
17. Assignment of duties. (Captain's crew briefing)	12 37 30	12 38 50	01 20	1	1	1	
18. Radio operation. (Captain's crew briefing)		40 10	01 20	1	1	1	
19. P.A. announcements. (Captain's crew briefing)		41 30	01 20	1	1	1	
20. Company reports.	12 41 30	12 43 00	01 30	1	1	1	POSSD's
WEATHER ANALYSIS							
	12 43 00	12 43 09	09	1	1	1	
21. Turbulence.		19	10	1	1	1	
22. Precipitation.		28	09	1	1	1	
23. Low ceilings enroute.		37	09	1	1	1	
24. Icing.		47	10	1	1	1	
25. Weather trends.		57	09	1	1	1	
26. Winds.		44 06	09	1	1	1	
27. Delays.		16	10	1	1	1	
28. Alternates.		26	10	1	1	1	
29. Terminal forecast.		34	08	1	1	1	
30. Severe weather warnings.		43	09	1	1	1	
31. CAT (clear air turb.) forecast.		51	08	1	1	1	
32. SIGMETS.		45 00	09	1	1	1	
33. Surface charts.							S.O. leaves for airplane.
FPF (FLIGHT PLAN FORECAST) ANALYSIS							
	12 45 00	12 45 10	10	1	1		
34. Radio call number (UA 280 Heavy)		20	10	1	1		
35. Flight number (280)							

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
36.	Airplane number (7406)	12 45 20	12 45 25	05	1	1		
37.	Date (15 June 82)		30	05	1	1		
38.	Controlling dispatch sectors.		35	05	1	1		
39.	FPF number (FPF2)		40	05	1	1		
40.	Planned flight time (1:45)		55	15	1	1		
41.	Scheduled target time (1:46)		00	05	1	1		
42.	Planned fuel burn (25,600#)		20	20	1	1		Fuel considera-
43.	FAR fuel reserve (10,500#)		30	10	1	1		tions.
44.	Alternate fuel (10,500#)		45	15	1	1		
45.	Holding fuel (6,000#)		47 00	15	1	1		
46.	Reason for alternate and holding fuel (Thunderstorms)		15	15	1	1		
47.	Mileage (809NM)		25	10	1	1		
48.	Planned take off weight (342,700#)	12 47 25	12 47 37	12	1	1		
49.	Allowable operating weight (373,400#)		48	11	1	1		Weight consider-
50.	Planned landing weight (313,100#)		48 00	12	1	1		ations.
51.	Allowable landing weight (347,800#)		10	10	1	1		
52.	Temperature deviation in climb (9° above standard)	12 48 10	12 48 15	05	1	1		
53.	Wind component (8 knot tail wind)		35	20	1	1		
54.	Zero fuel weight (290,100#)	12 48 35	12 48 45	10	1	1		
55	Fuel boarded at Denver.		55	10	1	1		
56.	Fuel required (52,600#)		49 10	15	1	1		
57.	Total fuel (52,600#)		25	15	1	1		
58.	Flight plan checkpoints.	12 49 25	12 49 50	25	1	1		
59.	Segment mileages.		50 15	25	1	1		
60.	Flight level (37,000')		25	10	1	1		
61.	Mach (822)		35	10	1	1		
62.	Temperature deviation (+4°)		45	10	1	1		
63.	Tropopause height (39,000')		55	10	1	1		
64.	True airspeed (519)		51 05	10	1	1		
65.	Wind (240°/44kts)		30	25	1	1		
66.	Ground speed.		50	20	1	1		
67	Segment time.		52 15	25	1	1		
68.	Segment fuel burn.	12 52 15	12 52 40	25	1	1		
69.	Fuel remaining.		53 00	20	1	1		
70.	Wind for descent (260°/37kts)	12 53 00	12 53 20	20	1	1		
71.	Flight identification number (UA280 Hvy)		25	05	1	1		
72.	FAA type and equipment (DC-10/A)		30	05	1	1		
73.	TAS (first segment (476kts)		35	05	1	1		
74	Departure station (DEN)		40	05	1	1		

DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
75. Planned departure time. (13:45)----------	12 53 40	12 53 50	10	1	1		
76. Flight level first segment (37,000')		54 00	10	1	1		
77. Planned route.		30	30	1	1		
78. Estimated time enroute (1:44)		55 00	30	1	1		
79. MEL/CDL (*Minimum equipment list/Config. dev. list*)----------	12 55 00	12 56 30	01 30	1	1		
80. POSBD's (Company operationally important messages)		58 00	01 30	1	1		Capt & First
81. Dispatch release message.		13 00 00	02 00	3	1		Officer leave for A/C.
AIRPLANE CONDITION - PREPARATION FOR FLIGHT							
82. Inbound crew report on condition.----------	13 00 00	13 02 00	02 00			2	S.O. arrives at
83. Log book deferred items.		02 30	30			2	airplane.
84. Log book required service.		03 00	30			2	
85. Battery switch-on.----------	13 03 00	13 03 03	03			1	
86. Circuit breakers-reset.		04 03	01 00			1	
87. Fire warning system A & B test switches - test & hold.----------	13 04 03	13 04 04	01			1	
88. Engine and APU fire warning lights - on.		05	01			2	
89. Fire loop lights on.		06	01			2	
90. Master warning lights - on.		07	01			2	
91. Engine fire bell - sounds.		08	01			2	
92. Fire warning system A & B test switches - release.		09	01			1	
93. All warning and loop sights - out.		10	01			2	
94. Engine fire bell - off.		11	01			2	
95. Engine ignition switches - check off.----------	13 04 11	13 04 16	05			1	
96. APU isolation valve - check closed.		18	02			1	
97. APU generator bus switches - check off.		19	01			1	
98. APU fire control switch - normal.		20	01			1	
99. APU oil quantity - 4 qts. minimum.		21	01			1	
100. APU fuel pump switch - on.		22	01			1	
101. APU master switch - run.		24	02			1	
102. APU door open light - on.		44	20			2	
103. APU master switch - start release to run.		46	02			1	
104. APU oil pressure low light - on.		47	01			2	
105. N_1 RPM - increasing.		48	01			2	
106. N_2 RPM - increasing.		49	01			2	
107. EGT - increasing.		05 04	15			2	
108. APU oil pressure low light - out by 50% N_2.		19	15			2	
109. APU generator off light - out.		24	05			2	
110. APU generator bus switches 1, 2 & 3 - on.		27	03			1	
111. #2 left aft fuel pump - on.		32	05			1	
112. APU fuel pump - off.		35	03			1	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL			REMARKS
											CAP.	F.O.	S.O.	
113.	Gear handle - check down.	13	05	35	13	05	37			02			1	
114.	Slat reset light - out.	13	05	37	13	05	39			02			1	
115.	Flap/slat handle - up/retract.	13	05	39	13	05	41			02			1	
116.	Hydraulic quantity - checked above the service mark.	13	05	41	13	05	43			02			1	
117.	Hydraulic quantity reminder bugs - set at indicated quantity.						48			05			1	
118.	Rudder standby power switch - armed.						49			01			1	
119.	Auxiliary hydraulic pump one - on.						51			02			1	
120.	#3 hydraulic pressure - 3000#.						56			05			2	
121.	Auxiliary pump one on light - on.						57			01			2	
122.	Bottom rudder moves slightly.						59			02			2	
123.	Auxiliary pump two - on.					06	00			01			1	
124.	Auxiliary pump two on light - on.						01			01			2	
125.	2-3 motor pump switch - armed.						02			01			1	
126.	#2 hydraulic pressure - 3000#.						06			04			2	
127.	Top and bottom rudder position indicators - center.						07			01			2	
128.	Rudder standby power switch - off.						08			01			1	
129.	1-3 motor pump switch - armed.						09			01			1	
130.	Hydraulic pressure systems 1, 2 and 3 - 3000#.						13			04			2	
131.	Galley power switches - on.						14			01			1	
132.	Galley overheat light - out.						15			01			1	
133.	#1 pneumatic manifold fail/test switch/light - push to test.	13	06	15	13	06	16			00.5			1	
134.	#1 & #2 fail/test switch/lights - on.						16			00.5			2	
135.	#1 switch - release.						17			00.5			1	
136.	#1 & #2 lights - out.						17			00.5			2	
137.	#2 pneumatic manifold fail/test switch/light - push to test.						18			00.5			1	
138.	#2 fail/test switch/light - on.						18			00.5			2	
139.	#2 switch - release.						19			00.5			1	
140.	#2 light - out.						19			00.5			2	
141.	#3 pneumatic manifold fail/test switch/light - push to test.						20			00.5			1	
142.	#3 fail/test switch/light - on.						20			00.5			2	
143.	#3 switch - release.						21			00.5			1	
144.	#3 light - out.						21			00.5			2	
145.	APU isolation valve switch - open.	13	06	21	13	06	22			01			1	
146.	1-2 & 1-3 isolation valve disagree lights - On then off.						25			03			2	
147.	Pneumatic system pressure indicators 1, 2 & 3 - approx. 30 psi.						26			01			2	
148.	APU N_1 indicator - increases slightly.						27			01			2	
149.	Airconditioning pack switches - auto.						28			01			1	
150.	Flow indicator gages 1, 2 & 3 - indicate flow.						29			01			2	
151.	Cabin temperature selectors - set to 72°.						31			02			1	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
152.	Lav/galley vent and cargo heat switch - on.						32			01			1	
153.	Oxygen quantity pressure - check approximately 1650 psi.						33			01			1	
154.	Water quantity - check for sufficient for the flight.						34			01			1	
155.	Engine oil quantity gages 1, 2 & 3 - check minimum of 14 quarts.	13	06	36	13	06	36			02			1	
156.	Air driven generator handle - stowed and safetied.	13	06	36	13	06	38			02			1	
157.	Aileron trim - zero.	13	06	38	13	06	40			02			1	
158.	Rudder trim - zero.						42			02			1	
159.	Radar - standby.						44			02			1	
160.	Park brake on lights - on.						46			02			1	
161.	Systems one and two brake pressure - normal.						48			02			1	
162.	Captain's stabilizer trim switches - nose up.	13	06	48	13	06	49			01			1	
163.	Trim handles - move aft.						50			01			2	
164.	Trim indicator - moves toward nose up.						51			01			2	
165.	Trim switches - nose down.						52			01			1	
166.	Trim handles - move forward.						53			01			2	
167.	Trim indicator moves toward nose down.						54			01			2	
168.	Captain's trim switches - split or move one at a time.						55			01			1	
169.	Trim indicator - does not move.						56			01			2	
170.	Repeat with the First Officer's trim switches.	13	06	56	13	07	04			08			2	
171.	Alternate trim switches - nose up or down.						06			02			1	
172.	Trim indicator - moves in appropriate direction.						08			02			2	
173.	Spoiler handle - check retracted.	13	07	08			10			02			1	
174.	Spoiler indicator tapes - zero.						12			02			1	
175.	Fuel levers 1, 2 & 3 - off.	13	07	12			14			02			1	
176.	N_1 thrust computer - select take off.						15			01			1	
177.	N_1 thrust computer take off selector - lighted blue.						16			01			2	
178.	N_1 indicator limit bugs - move to limit on computer.						17			01			2	
179.	Max pointers on all engine indicators - aligned with limits.						18			01			2	
180.	Hydraulic flight control lights - off.	13	07	18	13	07	20			02			1	
181.	Elevator feel switch - auto.						21			01			1	
182.	Flap limit switch - auto.						22			01			1	
183.	ADG switch - hydraulic.						23			01			1	
184.	Upper and lower A & B yaw damper switches - on.						24			01			1	
185.	Yaw damp test switch - press and release.						25			01			1	
186.	Yaw damp test switch - lights blue.						26			01			2	
187.	Upper and lower yaw damp test fail lights - come on.						27			01			2	
188.	Upper and lower yaw damp fail lights - come on.						28			01			2	
189.	Anti-skid switch - on.	13	07	28	13	07	29			01			1	
190.	Anti-skid fail lights - off.						30			01			2	
191.	Anti-skid test switch - press.						31			01			1	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
192.	Anti-skid fail lights - on.		32	01			2	
193.	Test switch - release.		33	01			1	
194.	Anti-skid fail lights - out.		34	01			2	
195.	Auxiliary vertical gyro switch - normal.	13 07 34	13 07 35	01			1	
196.	Flight director command switch - normal.		36	01			1	
197.	Ground proximity warning system inhibit switch - safetied norm.		37	01			1	
198.	Captain's compass system - slaved.		38	01			1	
199.	Captain's compasses - agree with wet compass and each other.		41	03			1	
200.	#1 INS MSU (mode selector unit) - align.	13 07 41	13 07 42	01			1	
201.	Voice recorder test button - press momentarily.	13 07 42	13 07 43	01			1	
202.	Voice recorder monitor - moves twice to the white band.		44	01			2	
203.	Install headset - make a test transmission.		49	05			1	
204.	Test transmission - repeats through headset.		50	01			2	
205.	Engine ignition switches - off.	13 07 50	13 07 51	01			1	
206.	Override and airstart switch - off.		52	01			1	
207.	Emergency light switch - armed.	13 07 52	13 07 53	01			1	
208.	Emergency light test button - hold for 3 to 4 seconds.		56	03			2	
209.	Emergency lights - come on.		57	01			2	
210.	Green test light - comes on.		58	01			1	
211.	Release test switch.		59	01			1	
212.	Lights - off.		08 00	01			2	
213.	Yaw damp test, test fail and fail lights - all off.	13 08 00	13 08 01	01			2	
214.	Captain's instrument panel - check fail flags normal.		02	01			2	
215.	Emergency power switch - on.		03	01			1	
216.	Emergency power in use lights - on.		04	01			2	
217.	Captain's instrument panel - check fail flags normal.		05	01			2	
218.	Battery ammeter - discharge.		06	01			2	
219.	Emergency power switch - off.		07	01			1	
220.	Power in use lights - off.		08	01			2	
221.	Battery ammeter - charge.		09	01			2	
222.	No smoking switch - on.	13 08 09	13 08 10	01			1	
223.	Seat belt sign switch - off.		11	01			1	
224.	Evacuation command switch - off.		12	01			1	
225.	Evacuation signal switch - armed.		13	01			1	
226.	#2 INS MSU - align.	13 08 13	13 08 14	01			1	
227.	First Officer's compass system - slaved.		15	01			1	
228.	First Officer's compasses agree with the wet compass and each other.		18	03			1	
229.	Hand set pick up.	13 08 18	13 08 20	02			1	
230.	P.A. switch press.		21	01			1	
231.	Make test transmission on P.A.		23	02			1	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
232.	P.A. meter - indicates system working.		24	01			2	
233.	Pitot heat switch - select each position.	13 08 24	13 08 27	03			1	
234.	Pitot heat ammeter - correct voltage for each position (0 on TAT)		31	04			2	
235.	Exterior light switches - on.	13 08 31	13 08 33	02			1	
236.	Annunciator light test switch - press.		35	02			1	
237.	Annunciator and indicator lights - on.		37	02			2	
238.	INS 1 & 2 radio/INS switches - INS.	13 08 37	13 08 39	02			1	
239.	1 & 2 data selectors - position.		41	02			1	
240.	1 & 2 test switches - press.		43	02			1	
241.	Data displays - show all 8's + NSEW		45	02			2	
242.	Hold, remote, insert, alert, bat, warn and waypoint change lts - on.		47	02			2	
243.	MSU ready NAV light - on.	13 08 47	13 08 49	02			2	
244.	MSU BAT light - on.		51	02			2	
245.	HSI (course indicator) - 0°		53	02			2	
246.	Course deviation bar - 1 dot right.		55	02			2	
247.	Test switch - release.		57	02			1	
248.	All lights - out.		59	02			2	
249.	Radio/INS switches - radio.		09 01	02			1	
250.	Fire extinguisher - in bracket.	13 09 01	13 09 06	05			1	
251.	Portable oxygen bottle - in bracket.		08	02			1	
252.	Smoke mask - attached to oxygen bottle.		11	03			1	
253.	Crash axe - in bracket.		13	02			1	
254.	5 smoke goggles - in pouches.		43	30			1	
255.	2 escape ropes - in ceiling compartments.		55	12			1	
256.	Spare bulbs - in ceiling compartment.		10 00	05			1	
	EXTERIOR INSPECTION							
257.	1, 2 & 3 air conditioning pack inlets - clear.	13 10 00	13 10 03	03			1	
258.	Left and right stall warning vanes - intact.		05	02			1	
259.	Oxygen thermal discharge disc - in place.		06	01			1	
260.	Pitot heads - uncovered, clear.		07	01			1	
261.	Radome - intact.		10	03			1	
262.	Nose gear doors - flush.		12	02			1	
263.	Taxi lights - clean.		14	02			1	
264.	Nose gear tires - good condition, inflated to 160 psi.		24	10			2	
265.	Wheels - good condition, blowout plugs in place.		29	05			1	
266.	Ground shift rod - not bent.		34	05			1	
267.	Strut extension - correct height.		36	02			1	
268.	Steering bypass valve - closed, no pin installed.		37	01			1	
269.	Gear down lock pin removed.		39	02			1	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL			REMARKS
											CAP.	F.O.	S.O.	
270.	Right main landing light - clean.	13	10	39	13	10	40			01			1	
271.	#3 air conditioning access door - closed.						43			03			1	
272.	#3 pack outlet door - clear.						46			03			1	
273.	Air driven generator door - closed.						47			01			1	
274.	Static ports - clean.						48			01			1	
275.	Cabin pressure relief valves - clear.						49			01			1	
276.	Forward cargo door - closed and locked (unless loading)						54			05			1	
277.	Cabin pressure relief valves - closed.						55			01			1	
278.	Center accessory compartment door - closed.						57			02			1	
279.	Right wing scan and turn off lights - intact.						58			01			1	
280.	Right wing fillet vent hole - clear.						59			01			1	
281.	Right inboard slats - retracted, undamaged.						02			03			1	
282	Engine 3 cowling - latched.						07			05			1	
283.	Engine 3 accessory doors - closed.						10			03			1	
284.	Engine 3 fins - undamaged.	13	11	10	13	11	12			02			1	
285.	Engine 3 inlet - smooth, no cracks.						15			03			1	
286.	Compressor blades - undamaged.						20			05			1	
287.	Accoustical material - undamaged.						25			05			1	
288.	Spinner - in place.						27			02			1	
289.	Fan air passage - clear.						29			02			1	
290.	Exhaust port - clear, no cracks.						31			02			1	
291.	Turbine blades - undamaged.						34			03			1	
292.	CSD oil cooler - undamaged, no leaks.						36			02			1	
293.	Flap supports - undamaged, no hydraulic leaks.						39			03			1	
294.	Wing access and service doors - closed.						42			03			1	
295.	Right fuel tank vent - clear.						44			02			1	
296.	Right out board slats - retracted, undamaged.						46			02			1	
297.	Right wing tip - undamaged.						48			02			1	
298.	Navigation lights - operating.						49			01			1	
299.	Static discharge wicks - intact.						50			01			1	
300.	Right fuel dump tube - clear						51			01			1	
301.	Right flaps - retracted, undamaged.						53			02			1	
302.	Right ailerons - faired, undamaged.						56			03			1	
303.	Top and bottom fuselage beacon lights - operating.						58			02			1	
304.	Right main gear tires - good condition, inflated to 180 psi.	13	11	58	13	12	08			10			2	
305.	Wheels - good condition, blow out plugs in place.						13			05			1	
306.	Strut extension - normal, even with the left.						15			02			1	
307.	Brake lines - intact, no leaks.						20			05			1	
308.	Gear doors - closed, undamaged.						23			03			1	
309.	Anti-skid assembly - undamaged, no leaks.						26			03			1	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
310.	Leveling cylinder - no leaks.		29	03			1	
311.	Gear down lock pins removed.		31	02			1	
312.	Grounding strap - in place.		32	01			1	
313.	Center cargo door - closed and locked.	13 12 32	13 12 37	05			1	
314.	APU intake door - open, clear.		39	02			1	
315.	APU exhaust - clear, undamaged.		41	02			1	
316.	Engine 2 work platform - closed, faired.		44	03			1	
317	Elevators - undamaged, inboard segments latched in place.		47	03			1	
318.	Stabilizers - undamaged.		50	03			1	
319.	Rudders - undamaged, faired.		53	03			1	
320.	Static discharge wicks - intact.		54	01			1	
321.	Engine 2 cowling-latched.		57	03			1	
322.	Tail cone - undamaged.		13 00	03			1	
323.	Aft cargo door - closed, latched.		05	05			1	
324.	Left main gear tires - good condition, inflated to 180 psi.		15	10			2	
325.	Wheels - good condition, blow out plugs in place.		20	05			1	
326.	Strut extension - normal.		22	02			1	
327.	Brake lines - intact, no leaks.	13 13 22	13 13 27	05			1	
328.	Gear doors - closed, undamaged.		30	03			1	
329.	Anti-skid assembly - undamaged, no leaks.		33	03			1	
330.	Leveling cylinder - no leaks.		36	03			1	
331.	Gear down lock pins - removed.		38	02			1	
332.	Grounding strap - in place.		39	01			1	
333.	Left ailerons - faired, undamaged.	13 13 39	13 13 42	03			1	
334.	Left flaps - retracted, undamaged.		45	03			1	
335.	Left fuel dump tube - clear.		46	01			1	
336.	Static discharge wicks - intact.		47	01			1	
337.	Left wing tip - undamaged.		49	02			1	
338.	Navigation lights - operating.		50	01			1	
339.	Left out board slats - retracted, undamaged.		52	02			1	
340.	Left fuel tank vent - clear.		54	02			1	
341.	Wing access and service doors - closed.		57	02			1	
342.	Flap supports - undamaged, no hydraulic leaks.		14 00	02			1	
343.	Engine 1 cowling - latched.	13 14 00	13 14 05	05			1	
344.	Engine 1 accessory doors - closed.		08	03			1	
345.	Engine 1 fins - undamaged.		10	02			1	
346.	Engine 1 inlet - smooth, no cracks.		13	03			1	
347.	Compressor blades - undamaged.		18	05			1	
348.	Accoustical material - undamaged.		23	05			1	
349.	Spinner - in place.		25	02			1	

DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
350. Fan air passage - clear.						27			02			1	
351. Exhaust port - clear, no cracks.						29			02			1	
352. Turbine blades - undamaged.						32			03			1	
353. CSD oil cooler - undamaged, no leaks.						34			02			1	
354. Left inboard slats - retracted, undamaged.	13	14	34	13	14	37			03			1	
355. Left wing fillet vent hole - clear.						38			01			1	
356. Left wing scan and turn off lights - intact.						39			01			1	
357. Pressure outflow valve - open, clear.						41			02			1	
358. Butterfly valve - open, clear.						43			02			1	
359. Ram shield assembly - undamaged, extended.						45			02			1	
360. Static ports - clean.						47			02			1	
361. Potable water service door - closed.						49			02			1	
362. 1 & 2 air conditioning pack outlet doors - clear.						55			06			1	
363. Air conditioning fuselage doors - latched.						57			02			1	
364. Left main landing light - clean.						59			02			1	
COCKPIT PREPARATION													
365. Exterior lights - off (day)	13	14	59	13	15	00			01			1	
366. Second Officer oxygen mask - don and adjust.	13	15	30	13	15	39			09			1	
367. Oxygen mask controls - normal/100%, check emergency flow.	13	15	39	13	15	42			03			1	
368. Mask/boom mic switch - mask.						43			01			1	
369. PA mic selector - press.						44			01			1	
370. Push to talk button - press and transmit.						45			01			1	
371. Passenger address system - clearly audible.						46			01			2	
372. Oxygen mask - stow on hanger. (Return mask/boom sw to boom).						47			01			1	
373. VHF COM 2 - tune to 124.45. (ATIS frequency)					16	02			15			2	
ATIS INFORMATION COPY													
374. Stapleton International airport information - Quebec.	13	16	02	13	16	06			04			2	
375. Clearance delivery @ 127.6.						10			04			2	
376. 13:15 weather - 1900' scattered.						14			04			2	
377. 4000' overcast.						18			04			2	
378. Visibility - 5 miles, light rain.						22			04			2	
379. Temperature - 53°.						26			04			2	
380. Dew point - 46°.						30			04			2	
381. Wind - 020°/7kts.						34			04			2	
382. Altimeter - 3007.						38			04			2	
383. Departures - runway 15 left.						42			04			2	
384. ATC clearance read back - only call sign, transponder code.						46			04			2	
385. Clearance delivery advise - information Quebec.						50			04			2	

DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
WEIGHT MANIFEST							
386. Operating weight empty - 245,444#.	13 50	13 16 52	02			1	
387. Pits (cargo) - 14,389#.			54	02			1
388. First class - 3,540#.			56	02			1
389. Cabin - 26,727#.			58	02			1
390. Zero fuel weight - 290,100#.		17 00	02			1	
391. Fuel on board - 53,700#.			02	02			1
392. Taxi fuel - 800#.			04	02			1
393. Take off gross weight - 343,000#.			06	02			1
394. Maximum take off gross weight - 373,400#.			08	02			1
395. ZMAC - 22.7.			10	02			1
FUEL SHEET							
396. Cleared fuel - 52,600#.	13 00	13 17 12	02			1	
397. Taxi fuel - 800#.			14	02			1
398. Total fuel requested - 53,400#.			16	02			1
399. Pre service fuel - 17,400#.			18	02			1
400. Calculated to be added 0 36,000#.			20	02			1
401. Calculated gallons to be added - 5,294.			22	02			1
402. Total from truck 8 - 5338 gallons.			24	02			1
403. Temperature gages - normal.	13 17 24	13 17	26	02			1
404. Left engine driven pump switches, 1, 2 & 3 - on.			30	04			1
405. Right engine driven pump switches - auto.			34	04			1
406. 1-3 motor pump switch - off.			38	04			1
407. #1 system pressure - dropping to zero.	13 17 38	13 18	58	01	20		2 Not waiting for
408. 2-3 motor pump switch - off.	13 17 38	13 17	42	04			1 drop to occur.
409. #2 system pressure - dropping to zero.			50	08			2
410. #3 system pressure - approximately 3000 psi.			52	02			2
411. Auxiliary hydraulic pump one - off.			54	02			1
412. #3 system pressure - no change.			56	02			2
413. Auxiliary hydraulic pump two - off.			58	02			1
414. #3 system pressure - dropping to zero.		18	08	10			2
415. Auxiliary pumps on lights - off.			10	02			2
416. Temperature high lights - off.			12	02			1
417. Pressure low lights 0 on.			14	02			1
ELECTRICAL SYSTEM CHECK							
418. CSD (constant speed drive) oil pressure low lights - on.	13 18 14	13 18	17	03			1
419. CSD switch guards - closed and safetied.			19	02			1
420. CSD oil temperature - normal.			21	02			1

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
421.	Generator *tail lights - off.*		23	02			1	
422.	Generator off lights - off.		25	02			1	
423.	Generator switches - on.		27	02			1	
424.	AC loads - zero.		29	02			1	
425.	AC bus off lights, buses 1, 2 & 3 - off.		31	02			1	
426.	Left emergency AC bus off light - off.		33	02			1	
427.	Right emergency AC bus off light - off.		35	02			1	
428.	Amber bus tie isolation lights - on.		37	02			1	
429.	Blue bus tie isolation lights - off.		39	02			1	
430.	*Dual land selected light - off.*		41	02			1	
431.	Dual land power on light - off.		43	02			1	
432.	AC bus tie switches - normal.		45	02			1	
433.	Emergency power in use light - off.		47	02			1	
434.	DC loads, TR 1, TR 2A, TR2B, & TR 3 - *normal.*		49	02			1	
435.	DC bus off lights, buses 1, 2 & 3 - off.		51	02			1	
436.	Left emergency DC bus off light 0 off.		53	02			1	
437.	Right emergency DC bus off light - off.		55	02			1	
438.	DC tie switches - open.		57	02			1	
439.	*DC tie closed lights - off.*		59	02			1	
440.	Battery switch - on.		19 01	02			1	
441.	Volt/amp/frequency selector - bat & left emergency bus.		04	03			1	
442.	AC volts - 115.	13 19 04	13 19 06	02			2	
443.	AC frequency - 400 hz.		08	02			2	
444.	Battery voltage - green band.		10	02			2	
	FUEL SYSTEM CHECK							
445.	Any cross feed switch - open.	13 19 10	13 19 12	02			1	
446.	That cross feed disagree light - on then off.		14	02			2	
447.	That cross feed switch - closed.		16	02			1	
448.	That cross feed disagree light - on the off.		18	02			2	
449.	All cross feed switches - closed.		20	02			1	
450.	All cross feed disagree lights - off.		22	02			2	
451.	Fuel schedule lights - off.		24	02			1	
452.	Fill valve switches - closed.		26	02			1	
453.	Fill valve open lights - off.		28	02			1	
454.	Fuel quantity gages 1, 2 & 3 - approximately even.		30	02			1	
455.	*Gage totals - equal to totalizer amount.*		35	05			2	
456.	Total fuel - agrees with flight plan and fuel sheet.		40	05			1	
457.	Fuel quantity test button - press and hold.		41	01			1	
458.	Fuel totalizer - reads 299,600#.		43	02			2	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
459.	Fuel quantity gages 1, 2 & 3 - read 99,900#.		45	02			2	
460.	Fuel quantity test button - release.		46	01			1	
461.	Fuel gages - return to previous reading.		48	02			2	
462.	Fuel quantity indicator test switches, 1, 2 & 3 - to S.		50	02			1	
463.	Quantities - read 10,500# (+/-200).		52	02			2	
464.	Fuel quantity indicator test switches - to C.		54	02			1	
465.	Quantities - read 10,500# (+/-200).		56	02			2	
466.	Indicator test switches - release.		58	02			1	
467.	Quantity indicators - return to previous reading.		20 00	02			2	
468.	Fuel manifold drain switches - safties closed.		02	02			1	
469.	Tank pump switches - off except 1 number 2 pump (APU.)		06	04			1	
470.	Pressure low lights - off.		07	01			1	
471.	Fuel dump switch - closed.		08	01			1	
472.	Fuel used reset button - press and hold.		28	20			1	
473.	Fuel used indicators - reset to zero.		29	01			1	
474.	Reset button - release.		30	01			1	
475.	ZFW knob (on totalizer) - push in and set the zero fuel weight.		45	15			1	
476.	ZFW knob - release.		46	01			1	
477.	Gross weight indicator should read - ZFW + fuel (343,000#).		51	05			2	
	PNEUMATIC AND AIR CONDITIONING CHECKS							
478.	Engine bleed switches, 1, 2 & 3 - off.	13 20 51	13 20 53	02			1	
479.	Pneumatic temperature gages - normal.	13 20 53	13 20 55	02			1	
480.	Pressure gages 0 normal.		57	02			1	
481.	1-3 & 1-2 isolation valve switches - normal.		59	02			1	
482.	Isolation valve disagree lights - off.		21 01	02			1	
483.	Flow gages - normal.		03	02			1	
484.	Wing anti-ice switch - off.		05	02			1	
485.	Wing anti-ice disagree light - off.		07	02			1	
486.	Pack off lights - off.		09	02			1	
487.	Pack indicator selector - pack one.		11	02			1	
488.	Turbine inlet temperature - normal.		13	02			2	
489.	Pack temperature valve - normal.		15	02			2	
490.	Pack discharge temperature - normal.		17	02			2	
491.	Pack indicator selector - pack two.		19	02			1	
492.	Pack inlet temperature - normal.		21	02			2	
493.	Pack temperature valve normal.		23	02			2	
494.	Pack discharge temperature - normal.		25	02			2	
495.	Pack indicator selector - pack three.		27	02			1	
496.	Pack inlet temperature - normal.		29	02			2	

DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
497. Pack temperature valve normal.		31	02			2	
498. Pack discharge temperature - normal.		33	02			2	
499. Compartment temperature selectors - auto. (approx. 72°).		38	05			1	
500. Trim air switch - on.		40	02			1	
501. Duct/avionic compartment overheat light - off.		42	02			1	
502. Duct temperatures - normal.		45	03			1	
503. Cabin compartment temperatures - approximately 72°.		48	03			1	
504. Oxygen mask eject switch - normal.		50	02			1	
505. Avionic flow switch - normal.		52	02			1	
PRESSURIZATION SYSTEM CHECK							
506. Mode switch - auto.	13 21 52	13 21	53 01			1	
507. Altitude scale - set to 667' (Chicago field elevation).			59 06			1	
508. Rate limiter - set to index.		22	00 01			1	
509. Standby on light - off.			01 01			1	
510. Cabin altitude warning light - off.			02 01			1	
511. Cabin pressure relief light - off.			03 01			1	
512. Cabin altitude rate indicator - zero.			04 01			1	
513. Cabin altimeter - 5,330'.			05 01			1	
514. *Differential pressure gage - zero.*			06 01			1	
515. Baro set scale - set 30.06.			07 01			1	
MISCELLANEOUS							
516. Master caution and warning lights - press to reset (if on).	13 22 07	13 22	10 03			1	
517. Second Officer's clock - set (if necessary).			17 07			1	
518. Annunciator lights area test selector - lower panel.	13 22 17	13 22	18 01			1	
519. Area test button - press and hold.			19 01			1	
520. All hydraulic and fuel annunciator lights - on.			23 04			2	
521. Test selector - upper panel 1.			24 01			1	
522. All electrical, APU and galley annunciator lights - on.			28 04			2	
523. Test selector - upper panel 2.			29 01			1	
524. All pneumatic & air conditioning annunciator lights - on.			33 04			2	
525. Test selector - upper panel 3.			34 01			1	
526. All Second Officer's annunciator panel lights - on.			38 04			2	
527. Area test button - release.			39 01			1	
528. Reverser valve open lights - out.			40 01			1	
529. Cargo door lights - out.			41 01			1	
530. Cargo door lights test switch - test.			42 01			1	
531. Forward, center & aft A & B lights - come on.			43 01			2	
532. Test switch - release.			44 01			1	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
533.	All A & B lights - off.		13 22 45	01			2	
534.	Engines 1, 2 & 3 oil temperature indicators - ambient.	13 22 45	13 22 46	01			1	
535.	Engines 1, 2 & 3 oil pressure indicators - zero.		47	01			1	
536.	Engines 1, 2 & 3 oil quantities - above 14 quarts.		48	01			1	
537.	Flight recorder test button - hold in.	13 22 48	13 22 49	01			1	
538.	Recorder off light - off.		50	01			2	
539.	Ident. and value indicators - read all 8's.		52	02			2	
540.	Test button - release.		53	01			1	
541.	Recorder off light - on.		54	01			2	
542.	Override/normal switch - override.		55	01			1	
543.	Recorder off light - off.		56	01			2	
544.	Trip key - press.		57	01			1	
545.	Ident. window - reads 1.		59	02			2	
546.	Trip number - key in 00280.		23 02	03			1	
547.	Value window - reads 00280.		04	02			2	
548.	Enter key - press.		05	01			1	
549.	Ident & value windows - go blank.		07	02			2	
550.	Date key - press.		08	01			1	
551.	Ident window - reads 2.		09	01			2	
552.	Date - key in 06152 (June 15, 1982).		12	03			1	
553.	Value window - reads 06152.		14	02			2	
554.	Enter key - press.		15	01			1	
555.	Leg key - press.		16	01			1	
556.	Ident. window - reads 3.		17	01			2	
557.	Leg - key in 00001 (1st leg of trip).		20	03			1	
558.	Value window - reads 00001.		22	02			2	
559.	Override/normal switch - normal.		23	01			1	
560.	Recorder off light - on.		25	02			2	
561.	Maintenance interphone switch - off.	13 23 25	13 23 27	02			1	
	ACARS FLIGHT INFORMATION LOADING							
562.	VHF com radios 1 & 2 - not tuned to 131.55 (ACARS freq.)	13 23 27	13 23 32	05			2	
563.	Data mode key - press.		34	02			1	
564.	Data mode key - lighted.		36	02			2	
565.	Link test key - press.		38	02			1	
566.	Data display - shows test pattern.		40	02			2	
567.	Keys lights - on.		42	02			2	
568.	Indicator lights - on, including link test key.		44	02			2	
569.	Link test key - release.		46	02			1	
570.	Data display, key & indic. lights - out (except data key).		48	02			2	

DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
571. Flight number key - press.						50			02			1	
572. Flight number key - lighted.						52			02			2	
573. Data display - shows previous flight number.						54			02			2	
574. Clear key - press.						56			02			1	
575. Keys, number 2, 8 & 0 - press.						59			03			1	
576. Data display - shows flight number 280.					24	01			02			2	
577. Enter key - press.						03			02			1	
578. Flight number key light - out.						05			02			2	
579. Data display - blank.						07			02			2	
580. Departure station key - press.						09			02			1	
581. Dep sta key - lighted.						11			02			1	
582. Data display - shows DEN (last dest sta is automatic dep sta).						13			02			1	
583. Enter key - press.						15			02			1	
584. Dep sta key light - out.						17			02			2	
585. Destination key - press.						19			02			1	
586. Dest key - lighted.						21			02			2	
587. Clear key - push.						23			02			1	
588. Station switches - set destination code ORD.						26			03			1	
589. Data display - shows ORD.						28			02			2	
590. Enter key - press.						30			02			1	
591. Data display - blank.						32			02			2	
592. Dest sta key light - out.						34			02			2	
593. Fuel/landing key - press.						36			02			1	
594. Fuel lndg key - lighted.						38			02			2	
595. Data display - shows FO (fuel on board).						40			02			2	
596. Keys, 5, 3 & 7 - press.						43			03			1	
597. Data display - shows 537 (53,700#).						45			02			2	
598. Enter key - press.						47			02			1	
599. Data display - blank, then FB (fuel boarded).						49			02			2	
600. Keys 5, 2, 9 & 4 - press.						52			03			2	
601. Data display - shows 5294 (5,294 gals boarded).	13	24	52	13	24	54			02			2	
602. Enter key - press.						56			02			1	
603. Data display - blank.						58			02			2	
604. Fuel/lndg key light - out.					25	00			02			2	
TAKE OFF DATA CARD													
605. Flight plan gross weight - compare with weight manifest.	13	25	00	13	25	10			10			2	
606. Flap setting - select position 5.						40			30			2	Open Gr. Wt. manual & confer with Capt. & F.O.
607. Structural limit - 410,000#. (Handbook).						45			05			2	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
608.	Runway limit - approximately 405,000#. (gross weight manual)		26 05	20			2	
609.	Performance limit - approximately 392,000#. (gross weight manual)			15	10			2
610.	Gross weight (343,000#) - compare with struct., rnwy & perf. (must			25	10			2
611.	Thrust limit temperature - 90° (handbook) be less).			30	05			2
612.	Performance limit temperature - approximately 91°. (Gr. wt. manual)			35	05			2
613.	Runway limit temperature - approximately 108°. (Gr. wt. manual)			40	05			2
614.	Equivalent temp. - 90° (smallest of thrust, perf. or rnwy limits).			42	02			2
615.	Normal thrust - 100.2% N_1 (Equiv temp vs reported temp in chart).			57	15			2
616.	Limit thrust - 103.4% N_1 (Pressure altitude vs rptd temp in chart).		27 12	15			2	
617.	V_1 - 139 knots (press alt vs equiv temp vs flap pos vs gr wt).			32	20			2 Open handbook.
618.	V_R - 144 knots (press alt vs equiv temp vs flap pos vs gr wt).			38	06			2
619.	V_2 - 154 knots (press alt vs equiv temp vs flap pos vs gr wt).			44	06			2
620.	Flap 0 speed - 158 (press alt vs equiv temp vs flap pos vs gr wt).			50	06			2
621.	Ret slat spd - 189 (press alt vs equiv temp vs flap pos vs gr wt).			56	06			2
622.	Cln man. spd - 204 (press alt vs equiv temp vs flap pos vs gr wt).		28 02	06			2	
623.	"T" procedure - not required at Denver.			12	10			2
624.	% MAC - 22.7.			15	03			2
625.	Flap setting - 5.			18	03			2
626.	Stabilizer trim setting - 4.0 (Flap position vs % MAC).			30	12			2
627.	ATIS information Quebec - enter on card.		29 00	30			2	
	CABIN CREW BRIEFING							
628.	Cockpit visits - only after interphone contact.	13 12 00	13 12 15	15	2	1		Capt. & F.O. are
629.	Cockpit visits on ground - only if holding.			30	15	2	1	at airplane.
630.	Weather enroute - possible turbulence in clouds, smooth on top.		13 30	01 00	2	1		
631.	Taxi time - short to runway 35 left.		14 00	30	2	1		
632.	Cockpit visit signal - two raps.			30	30	2	1	
633.	Unusual cabin condition - 2 wheel chair passengers.		15 00	30	2	1		
	COCKPIT PREPARATION CAPTAIN							
634.	Log book briefing - Second Officer vs Captain.	13 15 00	13 15 10	10	2		2	
635.	External condition - Second Officer vs Captain.			20	10	2		2
636.	Cockpit door signal - Captain vs Second Officer.			30	10	2		2
637.	Seat position - adjust for correct eye position.	13 15 30	13 15 35	05	1			
638.	Master caution and warning lights - out (reset if necessary).			36	01	1		
639.	Cockpit lights - adjust.			39	03	1		
640.	Sliding window - check secure.			40	01	1		
641.	Oxygen mask - put on and adjust.			49	09	1		
642.	Oxygen mask controls - normal/100%).			55	06	1		

DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
643. Mask/boom mic switch - mask.						57			02	1			
644. Regulator - emergency.						59			02	1			
645. Oxygen flow - normal.					16	00			01	1			
646. Regulator - normal.						01			01	1			
647. Jack box int switch - press.						02			01	1			
648. Mic switch - press and transmit.						04			02	1			
649. Speaker and hack box volume - adjust.						06			02	1			
650. Mask/boom switch - boom.						07			01	1			
651. Mask - stow in holder.						16			09	1			
OVERHEAD PANEL CHECK													
652. Hydraulic flight control lights - off.	13	16	16	13	16	17			01	1			
653. Elevator feel switch - auto.						18			01	1			
654. Flap limit switch - auto.						19			01	1			
655. ADG switch - hydraulic.						20			01	1			
656. Upper and lower A & B yaw damper switches - on.						21			01	1			
657. Anti-skid switch - off.						22			01	1			
658. Auxiliary vertical gyro switch - normal.						23			01	1			
659. Flight director command switch - normal.						24			01	1			
660. Ground proximity warning system inhibit switch - normal.						25			01	1			
661. Captain's compass system - slaved.						26			01	1			
662. Compasses - aligned.						27			01	1			
663. #1 INS MSU - align.						28			01	1			
664. Engine ignition switch - off.						29			01	1			
665. Override and airstart switch - off.						30			01	1			
666. Emergency light switch - armed.						31			01	1			
667. Emergency power switch - off.						32			01	1			
668. No smoking switch - on.						33			01	1			
669. Seat belt sign switch - off.						34			01	1			
670. Evacuation command switch - off.						35			01	1			
671. Evacuation signal switch - armed.						36			01	1			
672. #2 INS MSU - align.						37			01	1			
673. First Officer's compass system - slaved.						38			01	1			
674. Compasses - aligned.						39			01	1			
FLIGHT GUIDANCE SYSTEM AND FORWARD INSTRUMENT PANEL CHECKS													
675. Flight director switch - on.	13	16	39	13	16	40			01	1			
676. FMS (flight mode annunciator) steer window - reads HDG HOLD.						41			01	2			
677. FMA pitch window - reads ALT HOLD.						42			01	2			

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
678.	Flight director command bars - centered.		13 17 43	01	2			
679.	#1 VOR - tune any ILS frequency.		44	01	1			
680.	#1 course selector - set to airplane heading (180° at gate).		49	05	1			
681.	#1 course pointer - indicating selected heading.		50	01	2			
682.	ILS test switch - hold to up/left.		51	01	1			
683.	Attitude indicator runway & glide slope flags - appear/disappear.		54	03	2			
684.	Attitude indicator runway symbol - moves one dot left.		55	01	2			
685.	Attitude indicator glide slope pointer - moves one dot up.		56	01	2			
686.	Course indicator NAV & glide slope flags - appear/disappear.		54	03				Synon with 684.
687.	Course indicator course deviation indicator - moves one dot left.		55	01				Synon with 685.
688.	Course indicator glide slope pointer - moves one dot up.		56	01				Synon with 686.
689.	ILS test switch - release.		57	01	1			
690.	Attitude and course indicators - return to previous indications.		58	01	2			
691.	ILS switch - hold to down/right.		59	01	1			
692.	Attitude indicator runway & glide slope flags - appear/disappear.		02	03	2			
693.	Attitude indicator runway symbol - moves one dot right.		03	01	2			
694.	Attitude indicator glide slope pointer - moves one dot down.		04	01	2			
695.	Course indicator NAV & glide slope flags - appear/disappear.		02	03				Synon with 692.
696.	Course indicator course deviation indicator - moves one dot right.		03	01				Synon with 693.
697.	Course indicator glide slope pointer - moves one dot down.		04	01				Synon with 694.
698.	ILS test switch - release.		05	01	1			
NOTE:	First Officer may coordinate his ILS test at the same time.							
699.	#1 VOR - tune 110.0 (DEN VOT).	13 17 05	13 17 09	04	1			
700.	#1 course selector - set to 000° or 180°.		15	06	1			
701.	Captain's RMI ADF/VOR selectors - VOR.		17	02	1			
702.	Course deviation bar - centered (within + 2.5°)		18	01	2			
703.	To/from indicator - reads TO 180 or FROM 000.		19	01	2			
704.	#1 & #2 RMI pointers - point to 180° (±2.5°,3°max from each other).		20	01	2			
705.	Course deviation - within 3° of First Officer's.		21	01	2			
706.	#1 VOR - tune 117.0 (DEN VOR).		25	04	1			
707.	#1 course selector - set 072° (out bound radial from Denver).		31	06	1			
708.	DME switch - normal.		32	01	1			
709.	Auto throttle switches - off.		33	01	1			
710.	Auto throttle speed selector - set 124 knots (V2 + 70).		39	06	1			
711.	#1 & #2 command speed bugs - point to 124 knots.	13 17 39	13 17 40	01	1			
712.	Heading selector - set to 180° (heading at the gate)		46	06	1			
713.	Heading selector - pull out (arms heading select mode.		47	01	1			
714.	FMA steer annunciator - reads HDG SEL.		48	01	2			

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
715.	Flight director steer command bar - centered.		49	01	2			
716.	Heading selector - select left.		52	03	1			
717.	Steer bar - commands left.		53	01	2			
718.	Heading selector - select right.		56	03	1			
719.	Steer bar - commands right.		57	01	2			
720.	Heading selector - select 100° (anticipated first turn).		18 01	04	1			
721.	Static air selector - normal.		02	01	1			
722.	Clock - set correct time if necessary.		06	04	1			
723.	Mach/airspeed indicator - normal.		07	01	1			
724.	Airspeed bugs - set 139 (V1), 154 (VR), & 189 (slat retract).		12	05	2			
725.	FCS mode test button - press and hold.		13	01	1			
726.	FCS mode annunciators - read T E S T.		15	02	2			
727.	Test button - release.		16	01	1			
728.	Mode annunciators - return to previous annunciations.		18	02	2			
729.	Attitude indicator - press and hold.		19	01	1			
730.	Horizon - shows 20° right bank & 10° pitch up.		21	02	2			
731.	Steer bar - commands right.		23	02	2			
732.	Pitch bar - commands up.		25	02	2			
733.	Decrab indicator - moves to right end of airplane symbol.		27	02	2			
734.	Runway symbol - indicates 100'.		29	02	2			
735.	FD, ATT & RWY flags - appear.		31	02	2			
736.	Test button - release.		32	01	1			
737.	Indicators - return to previous indications.		34	02	2			
738.	Radio altimeter DH (decision height) light - check off.		35	01	1			
739.	Set/test knob - press and hold.		36	01	1			
740.	Altitude tape - indicates 40'.		38	02	2			
741.	Warning flag - appears.		40	02	2			
742.	Set/test knob - release.		42	02	1			
743.	Altitude tape - indicates higher then returns to zero.		43	01	2			
744.	DH light - on.		44	01	2			
745.	Warning flag - retracts from view.		45	01	2			
746.	DH light - press.		46	01	1			
747.	DH light - off.		47	01	2			
748.	Altimeter baro set knob - set to 30.07.		51	04	1			
749.	Altimeter - reads 5,330' field elevation.		52	01	2			
750.	Marker beacon lights - push to test.		53	01	1			
751.	Marker beacon lights - on then off.		55	02	2			
752.	Radio/INS selector - verify in radio.	13 18 55	13 18 56	01	1			
753.	RMI & course indicator - agree with mag compass.		59	03	2			
754.	Vertical speed indicator - reads zero, no flag.		19 00	01	1			

DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
755. Standby attitude indicator knob - pull to cage.						03			03	1			
756. Standby attitude indicator knob - rotate to align airplane symbol.						06			03	1			
757. Warning flag - out of view.						07			01	2			
758. Standby altimeter baro set knob - set to 30.07.						10			03	1			
759. Standby altimeter - reads 5,330'.						11			01	2			
760. Standby airspeed indicator - reads zero.						12			01	1			
CENTER INSTRUMENT PANEL CHECK													
761. N1 limit bugs - match the thrust computer.	13	19	12	13	19	14			02	1			
762. N1 max pointers - on the red limit marks.						16			02	1			
763. EGT max pointers - on the red limit marks.						18			02	1			
764. EGT gages - indicate approximately ambient temperature.						20			02	1			
765. N2 max pointers - on the red limit marks.						22			02	1			
TAKE OFF WARNING HORN TEST													
766. Spoilers - retracted.	13	19	22	13	19	24			02	1			
767. Stabilizer trim - in green band.						26			02	1			
768. Parking brake - release (hold brake pedals on).						28			02	1			
769. Flaps/slats - up/retract.						30			02	1			
770. Throttle #1 or #2 - advance.						32			02	1			
771. Take off warning horn - sounds (also checks slat position).						34			02	2			
772. Parking brake - reset.						36			02	1			
THROTTLE QUADRANT CHECK													
773. Spoiler handle - retract position.	13	19	36	13	19	38			02	1			
774. Fuel levers - off.						40			02	1			
775. Throttles - closed.						42			02	1			
776. Take off/go around button (on #2 throttle) - press.						44			02	1			
777. FMA steer & pitch annunciators - read TAKE OFF.						46			02	2			
778. *Pitch command bar - commands half scale pitch up.*						48			02	2			
779. Fast/slow indicator - indicates half scale fast.						50			02	2			
PEDESTAL CHECK													
780. #1 VHF radio - tune 127.6 (DEN clearance delivery).	13	19	50	13	19	56			06	1			
781. Transfer switch - set to correct tuner (each set has two).						57			01	1			
782. #2 ADF - tune as desired. (#1 is not installed.)						59			02	1			
783. Weather radar function selector - test.					20	00			01	1			
784. Transfer switch - #1.						01			01	1			
785. Tilt control - full up.	13	20	01	13	20	02			01	1			
786. Gain control - auto.						04			02	1			

DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
787. Scope range marks - full counter clockwise.		07	03	1			
788. Intensity controls - full counter clockwise.		10	03	1			
789. Range selector one scope - 100 miles.		12	02	1			
790. Other scope range selector - 300 miles.		14	02	1			
791. Offset switch, 100 mile scope - ahead.		17	03	1			
792. Offset switch, 300 mile scope - left or right.		20	03	1			
793. Filter selectors both scopes - full bright.		22	02	1			
794. Vertical gyro selector - normal.		25	03	1			
795. 100 mile scope intensity and range marks - adjust.		28	03	1			
796. 100 mile scope filter selector - adjust.		31	03	1			
797. 300 mile scope intensity and range marks - adjust.		34	03	1			
798. Transfer switch - #2.		36	02	1			
799. Fault lights - on for 3 seconds.		39	03	2			
800. RT - fault light - not on. (after one minute.)		41	02	2			
FINAL VERIFICATION OF PREPARATION ITEMS							
801. RMI ADF/VOR switches - as desired.	13 20 41	13 20 44	03	1			
802. Nav frequency - correct. (117.0).		47	03	1			
803. Course selector - set (072°).		50	03	1			
804. Speed selector - correct speed (124).		53	03	1			
805. Heading selector - correct heading (100°).		56	03	1			
806. Altitude selector - set (if First Officer check complete).		58	02	1			
807. FGS FMA's - indicate take off mode engaged.		21 00	02	1			
COCKPIT PREPARATION FIRST OFFICER							
808. Cabin crew briefing - monitor.	13 12 00	13 15 00	03 00		2		
809. Log book briefing - monitor.	13 15 00	13 15 30	30		2		
810. Seat position - adjust.	13 15 30	13 15 35	05		1		
811. Master caution and warning lights - reset if necessary.		36	01		1		
812. Cockpit lights - adjust.		39	03		1		
813. Sliding window - check secure.		40	01		1		
814. Oxygen mask controls - normal/100%.		46	06		1		
815. Oxygen mask - put on and adjust.		55	09		1		
816. Regulator - emergency.		56	01		1		
817. Oxygen flow - normal.		57	01		1		
818. Regulator - normal.		58	01		1		
819. Mask/boom switch - mask.		16 00	02		1		
820. Jack box int switch - press.		02	02		1		
821. Mic switch - press and transmit.		03	01		1		

DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
822. Speaker and jack box volume - adjust.	13 16 03	13 16 04	01		1		
823. Mask/boom switch - boom.		05	01		1		
824. Mask - stow in holder.		14	09		1		
OVERHEAD PANEL CHECK							
825. Stall test switch - left and hold.	13 16 14	13 16 15	01		1		
826. Control column stick shaker - vibrates (after 5 seconds).		19	04		2		
827. Stall test switch - right and hold.		20	01		1		
828. Control column stick shaker - vibrates (after 5 seconds).		24	04		2		
829. Stall test switch - release.		25	01		1		
830. Stick shaker - off.		25	--		2		
831. Max speed warning test switch - position one.		26	01		1		
832. Speed warning clacker - audible.		27	01		2		
833. Max speed warning test switch - position two.		28	01		1		
834. Speed warning clacker - audible.		29	01		2		
835. Speed control test switch - slow.		30	01		1		
836. Fast/slow indicators 1 & 2 - 1/2 scale toward slow.		31	01		2		
837. Test switch - release.		32	01		1		
838. Fast/slow indicators - return to original position.		33	01		2		
839. Test switch - fast.		34	01		1		
840. Fast/slow indicators - return to original position.		35	01		2		
841. Left & right windshield anti-ice switches - normal.		36	01		1		
842. Windshield defog switch - on.		37	01		1		
843. #1, #2 & #3 engine anti-ice switches - off.		38	01		1		
844. Engine anti-ice disagree lights - off.		39	01		1		
845. No smoke switch - on.		40	01		1		
846. Seat belt sign switch - off.		41	01		1		
847. Flight director switch - on.		42	01		1		
848. FMA steer window - reads HDG HOLD.		43	01		2		
849. FMA pitch window - reads ALT HOLD.		43	--		2		
850. #2 VOR - tune any ILS frequency.		44	01		1		
851. #2 course selector - 180° (airplane heading).		49	05		2		
852. #2 course pointer - 180°.		50	01		2		
853. ILS test switch - up/left (may be coordinated with Captain's check).		51	01		1		
854. ADI RWY & GS flags - appear/disappear.		54	03		2		
855. ADI RWY & GS Runway symbol - one dot left.		55	01		2		
856. ADI RWY & GS pointer - one dot up.		56	01		2		
857. HSI NAV & GS flags - appear/disappear.		54	03				Synon with 855.
858. HSI NAV & GS course deviation indicator - one dot left.		55	01				Synon with 856.
859. HSI NAV & GS pointer - one dot up.		56	01				Synon with 857.

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
860.	ILS test switch release.						57			01		1		
861.	ADI & HSI indicators - return to previous indications.	13	16	57	13	16	58			01		2		
862.	Test switch - down right.						59			01		1		
863.	ADI RWY & GS flags - appear/disappear.					17	02			03		2		
864.	ADI RWY & GS runway symbol - one dot right.						03			01		2		
865.	ADI RWY & GS pointer - one dot down.						04			01		2		
866.	HSI NAV & GS flags - appear/disappear.						02			03				Synon with 864.
867.	HSI NAV & GS course deviation indicator - one dot right.						03			01				Synon with 865.
868.	HSI NAV & GS pointer - one dot down.						04			01				Synon with 866.
869.	ILS test switch - release.						05			01		1		
870.	ADI & HSI indicators - return to previous indications.						06			01		2		
871.	#2 VOR - tune 110.0 (DEN VOT).						09			03		1		
872.	#2 course selector - set to 000° or 180°.						15			06		1		
873.	First Officer's RMI ADF/VOR selectors - VOR.						17			02		1		
874.	Course deviation bar - centered (±2.5°).						18			01		2		
875.	To/from indicator - reads to 180° or from 000°.						19			01		2		
876.	#1 & #2 RMI pointers - 180° (±2.5°, max 3° from each other).						20			01		2		
877.	Course deviation - within 3° of Captain's.						21			01		2		
878.	#2 VOR - tune 117.0 (DEN VOR).						25			04		1		
879.	#2 course selector - 072°.						31			06		1		
880.	DME Switch - normal.						32			01		1		
881.	Heading selector - set 180° (monitor if Captain is checking).						46			14		1		Delay 8 sec for
882.	Heading selector - pull out. (monitor if Captain is checking).						47			01		1		Capt to set speed
883.	FMA steer annunciator - reads HDG SEL. (monitor if Captain is checking).						48			01		2		
884.	FD steer command bar - centered. (monitor if Captain is checking).						49			01		2		
885.	Heading selector - select left. (monitor if Captain is checking).						52			03		1		
886.	Steer bar - commands left. (monitor if Captain is checking).						53			01		2		
887.	Heading selector - select right. (monitor if Captain is checking).						56			03		1		
888.	Steer bar - commands right. (monitor if Captain is checking).						57			01		2		
889.	Heading selector - 100°. (monitor if Captain is checking).						01			04		1		
890.	Static air selector - normal.						02			01		1		
891.	Marker beacon lights - press to test.						03			01		1		
892.	Marker beacon lights - on/off.						05			02		2		
893.	Altimeter baro set knob - set to 30.07.						09			04		1		
894.	Altimeter - 5,330'.						10			01		1		
895.	Radio altimeter DH light - off.						11			01		1		
896.	Set/test knob - press and hold.						12			01		1		
897.	Altitude tape - indicates 40'.						14			02		2		
898.	Warning flag - appears.						16			02		2		
899.	Set/test knob - release.						18			02		1		

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
900.	Tape - indicates higher than zero.		19	01		2		
901.	DH light - on.		20	01		2		
902.	Warning flag - out of view.	13 18 20	13 18 21	01		2		
903.	DH light - press.		23	02		1		
904.	DH light - off.		25	02		2		
905.	FGS mode test button - press and hold.		26	01		1		
906.	FMA's - read T E S T.		34	08		2		
907.	TEST button - release.		35	01		1		
908.	FMA's - return to previous annunciations.		36	01		2		
909.	ADI test button - press and hold.		37	01		1		
910.	Horizon - shows 20° right bank & 10° pitch up.		42	05		2		
911.	Steer bar - commands right.		47	05		2		
912.	Pitch bar - commands up.		49	02		2		
913.	Decrab indicator - right end of airplane symbol.		54	05		2		
914.	Runway symbol - indicates 100'.		59	05		2		
915.	FD, ATT & RWY flags appears.		19 04	05		2		
916.	Test button - release.		05	01		1		
917.	Indicators - return to previous indications.		06	01		2		
918.	Mach/airspeed indicator - normal.		10	04		1		
919.	Airspeed bugs - set 139, 154 & 189.		30	20		1		
920.	Stabilizer trim switches - set stabilizer to 4.0.		20 07	37		1		
921.	Radar test - coordinate with Captain.	13 20 07	13 20 34	27		1		
922.	Vertical speed indicator - reads zero, no flags.		39	05		1		
923.	RMI & course indicator - agree with mag compass.		49	10		1		
924.	TAS/SAT - no warning flags.		54	05		1		
925.	Radio/INS selector switch - radio.		21 00	06		1		
926.	Present position & wypts 1 & 9 - load (coord with Capt).	13 21 00	13 22 00	01 00				
927.	Thrust computer take off mode - engaged.		05	05		1		
928.	Speed brake & slat reset lights - off.		10	05		1		
929.	N1 thrust computer TAT - agrees with SAT & reported temp.		20	10		1		
930.	Flap/slat handles - up/retract.		25	05		1		
931.	Flap handle position indicators - show up.		30	05		1		
932.	Flap position tapes - out of view.		35	05		1		
933.	Flap disagree warning flag - out of view.		40	05		1		
934.	Slat position lights - off.		45	05		1		
935.	Spoiler handle - retract.		50	05		1		
936.	Cockpit flight controls - agree with indicated positions.		55	05		1		
937.	Ground proximity warning system light - press and hold.		56	01		1		
938.	GPWS fail light - on.		58	02		2		
939.	Below GS lights - on.		23 00	02		2		

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
940.	Glide slope aural warning - audible.	13	23	00	13	23	05			05	1	2		
941.	Pull up aural warning - audible.						10			05	1	2		
942.	Warning light - release.						11			01	1	1		
943.	GPWS lights & aural warnings - off.						13			02	1	2		
944.	Take off flap selector - set to position 5.						15			02	1	1		
945.	Final items - verify (RMI/ADF, HDG, ALT, NAV/freq, CRS & T.O. mode).					27	50		04	35	1	1		
946.	Jack box mic selector - VHF 1.						55			05	1	1		
947.	Captain - notify clearance is to be received.					28	00			05	1	1		
948.	Denver clearance - call, with gate 22 position.						09			09	2	2		
949.	Denver clearance delivery - acknowledges.						13			04	2	2		
950.	Clearance - Chicago as filed.						17			04	2	2		
951.	Departure - Denver 6, Hayes center.						21			04	2	2		
952.	Transponder - 4832.						25			04	2	2		
953.	Ground control frequency when ready to taxi - 121.9.						29			04	2	2		
954.	Clearance - acknowledge.						33			04	2	2		
955.	Transponder selector - standby.						36			03	1	1		
956.	Transponder code selectors - 4832.						46			10	1	1		
957.	Transponder mode selector - A.						48			02	1	1		
958.	Altitude reporting switch - Altitude reporting.						50			02	1	1		
959.	Altitude source switch.						52			02	1	1		
960.	ADF - set.					29	07			15	1	1	1	
961.	Marker selector switch - low.						09			02	1	1	1	
962.	Nav radios & FGS - verify set properly.						14			05	1	1	1	
	INERTIAL NAVIGATION SYSTEM													
963.	INS CDU #1 data selector - position.	13	21	00	13	21	01			01	1	1		
964.	Gate position - determine (N39°45.7', W104°53.3' - gate card).						03			02	1	1		
965.	N/2 key - press (Capt).						04			01	1	1		
966.	Insert key - lighted.						05			01	2	1		
967.	Keys 3, 9, 4, 5 & 7 - press (Capt).						07			02	1	1		
968.	Left display - shows 39°45.7'N (First Officer verifies).						08			01	2	2		
969.	Insert key - press (Capt).						09			01	1	1		
970.	Insert key - remains lighted.						10			01	2	1		
971.	W/A key - press (Capt).						11			01	1	1		
972	Keys 1, 0, 4, 5, 3 & 3 - press (Capt).						13			02	1	1		
973.	Right display - shows 104°53.3W (F.O. verifies).						14			01	2	2		
974.	Insert key - press (Capt).						15			00.5	1	1		
975.	Insert key light - off.						15			00.5	2	1		
976.	Latitude and Longitude displayed - verify (Capt & F.O.).						16			01	2	2		
977.	INS CDU #2 data selector - position.						17			01	1	1		

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
978.	N/2 key - press (F.O.).	13	21	17	13	21	18			01	1	1		
979.	Insert key - lighted.						19			01	1	1		
980.	Keys 3, 9, 4, 5 & 7 - press (F.O.).						21			02	1	2		
981.	Left display - shows 39°53.3N (Capt verifies).						22			01	2	2		
982.	Insert key - press (F.O.).						23			00.5	1	1		
983.	Insert key - remains lighted.						23			00.5	1	2		
984.	W/4 key - press (F.O.).						24			01	1	1		
985.	Keys 1, 0, 4, 5, 3 & 3 - press (F.O.).						27			03	1	1		
986.	Right display - shows 104°53.3W (Capt verifies).						28			01	2	2		
987.	Insert key - press (F.O.).						29			00.5	1	1		
988.	Insert key light - off.						29			00.5	2	2		
989.	Data selectors 1 & 2 - desired track and status.						30			01	1	1		
990.	Performance index 5 - confirm (Capt & F.O.).						31			01	2	2		
991.	Remote keys 1 & 2 - press (Capt & F.O.).						32			00.5	1	1		
992.	Remote key lights 1 & 2 - on.						32			00.5	2	2		
993.	Data selectors 1 & 2 - waypoint (Capt & F.O.).						33			01	1	1		
994.	Way point selectors 1 & 2 - way point 1 (to load present position).						34			01	1	1		
995.	N 39°45.7' - read by Capt, keyed in by First Officer.						37			03	1	2		
996.	N 39°45.7' - confirmed by Capt, inserted by First Officer.						38			01	2	1		
997.	Insert light - out.						39			01	2	2		
998.	W104°53.3' - read by Capt, keyed in by First Officer.						42			03	1	2		
999.	W104°53.3' - confirmed by Capt, inserted by First Officer.						44			02	2	1		
1000.	Way point selectors 1 & 2 - way point 9 (to load destination pos.).						45			01	1	1		
1001.	N 41°58.5' - read by Capt , keyed in by First Officer.						48			03	1	2		
1002.	N 41°58.5' - confirmed by Capt, inserted by First Officer.						49			01	2	1		
1003.	Insert light - out.						50			01	2	2		
1004.	W 87°54.4' read by Capt, keyed in by First Officer.						53			03	1	2		
1005.	W 87°54.4' confirmed by Capt, inserted by First Officer.						54			01	2	1		
1006.	Insert light - out.						55			01	2	2		
1007.	Ready NAV lights 1 & 2 - on.						56			01	2	2		
1008.	Mode selector switches 1 & 2 - NAV (Capt & F.O.).						58			02	1	1		
1009.	Data selector switches - desired track and status.						59			01	1	1		
1010.	Right displays - show 1 (ready to navigate).					22	00			01	2	2		
	BEFORE START & STARTING PROCEDURES													
1011.	#1 VHF radio - tuned to 129.5 (freq from flt. ops. manual).	13	29	14	13	29	15			01	1	1	1	
1012.	United ramp planner - call for poss. delays (F.O.).						17			02	1	1	1	
1013.	United ramp planner - responds.						19			02	1	1	1	
1014.	Delay information - requested.						21			02	1	2	1	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
1015.	No anticipated delay - ramp planner. ----------	13	29	21	13	29	23			02	2	2	1	
1016.	Seat belt sign switch - on.						24			01	1	1	1	
1017.	Cabin announcement - Flight attendants, prepare for departure.						28			04	2	1	1	
1018.	Before start checklist - called for by Captain.						30			02	1	1	1	
1019.	Checklist - read by First Officer, response by approp. crew member.						40			10	1	1	1	
1020.	Sliding windows - roller forward, handle latched (Capt & F.O.).						45			05	2	2	1	
1021.	Parking brake - set/pressure normal (Capt).						50			05	2	1	1	
1022.	Oxygen - checked (Capt, F.O. & S.O.).					30	05			15	2	3	2	
1023.	Yaw dampers - on (Capt).						10			05	2	1	1	
1024.	INS - 2 on NAV (Capt).						20			10	2	1	1	
1025.	Cabin signs - on (Capt).						25			05	2	1	1	
1026.	Windshield anti-ice/defog - normal.on (Capt).						35			10	2	1	1	
1027.	Thrust computer - T/O set (Capt).						40			05	2	1	1	
1028.	Radios, clocks & altimeters - set (Capt, F.O. & S.O.).						55			05	2	3	2	
1029.	Flap take off selector - 5, set (Capt).					31	05			10	2	1	1	
1030.	Fuel levers - off (Capt).						15			10	2	1	1	
1031.	Battery switch - bat & locked. (S.O.).						20			05	1	1	2	
1032.	Hydraulic quantity - normal (S.O.).						30			10	1	1	2	
1033.	Fuel - 53,700#, cleared with 52,600# (S.O.).						45			15	1	1	2	
1034.	Fuel crossfeeds - closed (S.O.).						50			05	1	1	2	
1035.	Oil quantity - normal (S.O.).						55			05	1	1	2	
1036.	Checklist - completed.					32	10			15	2	1	1	
1037.	Preflight safety inspection - complete (first flight attendant) -------	13	32	10	13	32	20			10	2	1	1	
1038.	First class passengers - 20. "						25			05	2	1	1	
1039.	Rear passengers - 151. "						30			05	2	1	1	
1040.	Flight attendants - 6. "						35			05	2	1	1	
1041.	Galley - occupied by one flight attendant during taxi						45			10	2	1	1	
1042.	Cargo door lights - checked out.(S.O.).						50			05	1	1	1	
1043.	Cockpit door - locked.						55			05	1	1	1	
1044.	United ramp planner - call for push back clearance.					33	00			05	1	1	1	
1045.	Clearance to push back - ramp planner.						15			15	2	2	1	
1046.	Ground mechanic - call for push back.						30			15	2	1	1	
1047.	Brakes - off (call from ground).						35			05	2	1	1	
1048.	Anti skid - off (call from ground).						40			05	2	1	1	
1049.	Clear to start all engines - ground.						45			05	2	1	1	
1050.	Brake pedals - push and release (Capt).						50			05	1	1	1	
1051.	Park brake on lights - off.						55			05	2	1	1	
1052	Anti collision light - on (F.O.).					34	00			05	1	1	1	
10	rt switch - start B (F.O.).						02			02	1	1	1	
105	97%.						06			04	1	1	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL			REMARKS
											CAP.	F.O.	S.O.	
1055.	ACARS send light - on (sending out time, fuel on brd & boarded). --------	13	34	06	13	34	07			01	1	1	1	
1056.	All aft fuel pumps - on.						11			04	1	1	1	
1057.	Aft fuel pump pressure low lights - on then off.						13			02	1	1	2	
1058.	All fuel pressure gages - normal.						16			03	1	1	2	
1059.	Pack switches - all off.						20			04	1	1	1	
1060.	Pneumatic pressure - approximately 30 psi.						23			03	1	1	2	
1061.	Ready for start announcement - Second Officer.						25			02	2	2	1	
1062.	Pneumatic pressure - 34 psi (S.O.).						27			02	2	2	1	
1063.	Start #3 command - Captain.						29			02	1	2	1	
1064.	Engine #3 start switch - in and magnetically held (F.O.).						30			01	1	1	1	
1065.	Starter switch light - on.						31			01	1	2	1	
1066.	#3 N2 - begins to increase.						33			02	2	2	2	
1067.	Pneumatic pressure - remains satisfactory during start. ----------	13	34	33	13	35	12			39	--	--	--	
1068.	#3 N2 - 15% and increasing.					34	40			07	2	1	1	
1069.	#3 fuel lever - on (Capt).						41			01	1	1	1	
1070.	#3 fuel flow - increases to approx. 5000#/hr.						42			01	2	2	2	
1071.	#3 EGT - indicates a rise within 25 seconds.						47			05	2	2	2	
1072.	#3 oil pressure - indicates a rise.						50			03	1	1	2	
1073.	#3 N2 - 45%.					35	09			19	1	2	1	
1074.	Start switch - magnetically released (pops out).						10			01	1	2	1	
1075.	Start switch light - out.						12			02	1	2	1	
1076.	N2 - stabilizes at approx. 60%.						34			22	2	2	2	
1077.	N1 - increases and stabilizes at approx. 20%.						35			01	2	2	2	
1078.	#3 engine oil pressure - minimum of 10 psi.						36			01	1	1	2	
1079.	#3 fuel pressure - increased to normal.						37			01	1	1	2	
1080.	1-3 isolation valve - closed (S.O.).						38			01	1	1	1	
1081.	#3 bleed air switch - on.						39			01	1	1	1	
1082.	#3 pack - auto.						40			00.	1	1	1	
1083.	#3 generator off light - off.						40			00.	1	1	2	
1084.	#3 generator load - normal.						41			01	1	1	2	
1085.	#3 APU power in use light - off.						42			01	1	1	2	
1086.	Ready for disconnect announcement - Second Officer.						43			01	2	1	1	
1087.	External power switch - off.						44			00.	1	1	1	
1088.	#3 AC bus tie isolate light - out.						44			00.	1	1	2	
1089.	Push back complete, park brake set announcement - ground mechanic.						45			01	2	1	1	
1090.	Brake pedals - applied (Capt).						46			01	1			
1091.	Park brake handle - set.						48			02	1			
1092.	Disconnect command - Captain.						50			02	2			
1093.	Disconnecting response - ground mechanic.						52			02	2			
1094.	Salute - ground mechanic.						54			02	2			

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
1095.	Response - taxi light On/off (Capt). ----------	13	35	54	13	35	56			02	2			
1096.	Taxi direction signal - ground mechanic.						58			02	2			
1097.	Start #1 command - Captain. ----------	13	35	45	13	35	46			01		1	1	
1098.	Engine 1 start switch - in and magnetically held.						47			01		2	1	
1099.	Starter switch light - on.						48			01		2	1	
1100.	#1 N2 - begins to increase.						50			02		2	2	
1101.	Pneumatic pressure - remains satisfactory for start.						51			01		1	2	
1102.	#1 N2 - 15% and increasing.						57			06	2	2	2	
1103.	#1 fuel lever - on (Capt).						58			01	1	1	1	
1104.	#1 fuel flow - increases.						59			01	2	2	2	
1105.	#1 EGT - indicates a rise in 25 seconds.					36	04			05	2	2	2	
1106.	#1 oil pressure - indicates a rise.						07			03		2	2	
1107.	#1 N2 - 45%.						26			19	1	1	1	
1108.	Start switch - out.						27			01	1	1	1	
1109.	Starter switch light - out.						29			02	1	1	1	
1110.	N2 - stabilizes at approx. 60%.						51			22	2		2	
1111.	N1 - increases to approx. 20 %.						52			01	2		2	
1112.	#1 oil pressure - 10 psi minimum.						53			01			2	
1113.	#1 fuel pressure - normal.						54			01			2	
1114.	1-2 isolation valve - closed.						56			02			1	
1115.	#1 bleed air switch - on.						57			01			1	
1116.	#1 pack - auto.						58			00.5			2	
1117.	#1 generator off light - off.						58			00.5			2	
1118.	#1 generator load - normal.						59			01			2	
1119.	#1 APU power in use light - off.					37	00			01			1	
1120.	#1 VHF radio - tuned to 119.5 (freq from clearance delivery). ----------	13	36	20	13	36	25			05		1		
1121.	Taxi clearance - requested (F.O.).						30			05		1		
1122.	Clearance to runway 35L - Denver ground control.						35			05	2	2		
1123.	Tower frequency when ready for take off - 119.5.						40			05	2	2		
1124.	Acknowledge taxi clearance - First Officer (monitored by Captain).					37	00			20	2	2		
1125.	Parking brake - off.						15			15	2	1	1	
1126.	1 & 3 throttles - advance to approx. 35 to 40%						17			02	2	1	1	
1127.	1 & 3 throttles - as necessary during taxi (Capt).					42	01		05	04	--	--	--	
1128.	Start #2 command - Captain. ----------	13	37	17	13	37	19			02	2	1	2	
1129.	Engine 2 start switch - in and magnetically held (S.O.).						20			01	2	1	1	
1130.	Starter switch light - on.						21			01	2	1	2	
1131.	#2 N2 - begins to increase.						23			02	2	1	2	
1132.	Pneumatic pressure - remains satisfactory for start.						25			02	2	1	2	
1133.	#2 N2 - 15% and increasing.						30			05	2	1	2	
1134.	#2 fuel lever - on (S.O.).						31			01	2	1	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL			REMARKS
											CAP.	F.O.	S.O.	
1135.	#2 fuel flow - increasing.	13	37	31	13	37	32			01	2	1	2	
1136.	#2 EGT - indicates a rise within 25 seconds.						37			05	2	1	2	
1137.	#2 oil pressure - indicates a rise.						40			03	2	1	2	
1138.	#2 N2 - 45%.					38	00			20	2	1	2	
1139.	Start switch - out.						01			01	2	1	2	
1140.	Starter switch light - out.						02			01	2	1	2	
1141.	N2 - stabilizes at approx. 60%.						24			22	2	1	2	
1142.	N1 - increases and stabilizes at approx. 20%.						25			01	2	1	2	
1143.	#2 engine oil pressure - 10 psi min.						26			01	2	1	2	
1144.	#2 fuel pressure - increased.						27			01	2	1	2	
1145.	ACARS data mode - select. (S.O.).						30			03	2	1	1	
1146.	Misc. key - press.						33			03	2	1	1	
1147.	Misc. key light - on.						35			02	2	1	2	
1148.	6 key - press twice.						40			05	2	1	1	
1149.	Data display - shows 66.						42			02	2	1	2	
1150.	Ent key - press.						44			02	2	1	1	
1151.	Data display - shows all 8's.						46			02	2	1	2	
1152.	Ent key - press.						48			02	2	1	1	
1153.	Data display - blank.						50			02	2	1	2	
1154.	Send key - press.						53			03	2	1	1	
1155.	Send key light - on/off.						55			02	2	1	2	
	AFTER START PROCEDURES													
1156.	Engine ignition - off (F.O.).	13	38	55	13	38	57			02	2	1		
1157.	Exterior lights - as required.						58			01	2	1		
1158.	Engine anti ice - as required.						59			01	2	1		
1159.	Hydraulic temperatures - normal.	13	38	55	13	38	56			00.			1	
1160.	Quantity gages - normal.						56			00.			1	
1161.	Quantity reminder bugs - set to indicated hyd. quantity.						57			01			1	
1162	Left engine driven pumps - on.						58			00.			1	
1163.	Right engine driven pumps - auto.						58			00.			1	
1164.	Rudder standby power switch - armed.						59			00.			1	
1165.	Rudder standby power off light - off.						59			00.			2	
1166.	Temperature high lights - off.					39	00			00.	2	1	1	
1167.	Pressure low lights - off.						00			00.	2	1	1	
1168.	1-3 & 2-3 motor pump switches - armed.						01			00.	2	1	1	
1169.	#1, 2 & 3 pressure gages - white band.						01			00.	2	1	1	
1170.	CSD temperature - normal (outlet).						02			00.	2	1	1	
1171.	CSD pressure low lights - out.						02			00.	2	1	1	
1172.	CSD push for rise button - press.						03			00.	2	1	1	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
1173.	CSD rise temperature - normal.	13 39 03	13 39 03	00.5	2	1	2	
1174.	Generator fail lights - off.		03	--				
1175.	Generator off lights - off.		03	--				
1176.	AC loads - normal.		04	00.5	2	1	1	
1177.	AC 3 bus tie isolate light - off.		04	00.5	2	1	1	
1178.	AC 1 & 2 bus tie isolate lights - on.		04	--				
1179.	Parallel generators button - press and release.		05	01	2	1	1	
1180.	AC tie 1 & 2 isolate lights 0 off.		06	01	2	1	1	
1181.	AC loads - even.		07	00.5	2	1	1	
1182.	AC annunciator lights - off.		07	00.5	2	1	1	
1183.	Volt/amp/freq selector - bat & left emerg. bus1		08	00.5	2	1	1	
1184.	AC volts - 115 (in yellow band).		08	00.5	2	1	2	
1185.	AC frequency - 400 (in yellow band).		09	00.5	2	1	2	
1186.	DC volts - in green band.		09	00.5	2	1	2	
1187.	Galley bus off lights - off.		10	00.5	2	1	1	
1188.	Galley switches - on.		10	00.5	2	1	1	
1189.	All fuel panel annunciator lights - off.		11	00.5	2	1	1	
1190.	Fuel quantity gages - equal.		11	00.5	2	1	1	
1191.	Fuel fill valve switches - closed.		12	00.5	2	1	1	
1192.	Fill valve open lights - off.		12	--				
1193.	All aft tank pumps - on.		12	00.5	2	1	1	
1194.	All x-feed valve switches - closed.		13	00.5	2	1	1	
1195.	All x-feed disagree lights - off.		13	00.5	2	1	1	
1196.	Fuel pressure gages - normal.		14	00.5	2	1	1	
1197.	Fuel used indicators - increasing.		14	00.5	2	1	1	
1198.	ACARS message waiting key light - flashing.		15	01	2	1	2	
1199.	Message waiting key - press (S.O.).		17	02	2	1	1	
1200.	Data display - shows ZFW 2901 (zero fuel weight 290,100#).		20	03	2	1	2	
1201.	Message waiting key light - flashing.		21	01	2	1	2	
1202.	Message waiting key - press.		23	02	2	1	1	
1203.	Data display - shows TOG 3430 (take off gr. wt. 343,000#).		26	03	2	1	2	
1204.	Message waiting key light - flashing.		27	01	2	1	2	
1205.	Message waiting key - press.		29	02	2	1	1	
1206.	Data display - shows CG 22.7 (CG22.7% MAC).		33	04	2	1	2	
1207.	Announcement to Captain - no weight manifest change (S.O.).		35	02	4	1	1	
1208.	Acknowledgement - Captain to S.O.		37	02	3	1	2	
1209.	APU isolation valve - closed.		38	01	2	1	1	
1210.	Engine 2 bleed switch - auto.		39	01	2	1	1	
1211.	#2 pack switch - auto.		40	01	2	1	1	
1212.	High stage open lights - may be on at low throttle setting.		41	01	2	1	1	

DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
1213. Manifold fail lights - off.	13	39	41	13	39	41			--				
1214. Pneumatic temperature high lights - off.						41			--				
1215. Pneumatic temperature gages - normal.						41			--				
1216. Pneumatic pressure gages - normal.						41			--				
1217. Flow gages - normal range.						42			01	2	1	1	
1218. Pack off lights - off.						42			--				
1219. 1-2 & 1-3 isolation valve switches - normal.						42			--				
1220. Engine oil quantity reminder bugs - set to indicated value.						43			01	2	1	1	
1221. Second Officer's annunciator lights - checked.						43			--				
1222. Forward annunciator lights panel - checked.						44			00.5	2	1	1	
1223. Engine instruments - checked.						44			00.5	2	1	1	
TAXI OUT PROCEDURES													
1224. Slat reset light - check off.	13	39	44	13	39	45			01	2	1	1	
1225. Flap/slat handle - position 5.						46			01	2	1	1	
1226. Slat disagree light - on then off.						47			00.5	2	2	1	
1227. Slat take off light - on.						47			00.5	2	2	1	
1228. Flap tapes - move to position 5.						48			00.5	2	2	1	
1229. Flap disagree flag - not in view.						48			00.5	2	2	1	
1230 Pitot heat selector - captain (F.O.).						49			01	2	1	1	
1231. Take off data - recheck.						50			01	3	2	1	
1232. Normal N1 (100.2) - compare with thrust computer.						51			01	3	2	1	
1233. Thrust computer N. - 103.4 (Normal must be within 3.5%).						52			01	3	2	1	
1234. Airspeed reminder bugs - recheck (139, 154 & 189)						53			01	3	2	1	
1235. Stabilizer trim - 4.0.						54			01	2	1	1	
1236. INS data selector - TK/GS.						55			01	2	1	1	
1237. Right data display - shows ground speed.						56			01	2	2	1	
1238. Control wheel - full left. (F.O.).						57			01	2	1	1	
1239. Wing indicator - shows full left.						58			01	2	2	1	
1240 Left spoiler tape - shows fully extended.						59			01	2	2	1	
1241. Control wheel - full right.					40	00			01	2	1	1	
1242. Wing indicator - shows full right.						01			01	2	2	1	
1243. Right spoiler tape - shows fully extended.						02			01	2	2	1	
1244. Control wheel - neutral.						03			01	2	1	1	
1245. Wing indicator - shows neutral.						04			01	2	2	1	
1246. Spoiler tapes - not in view.						05			01	2	2	1	
1247. Control wheel - full forward.						06			01	2	1	1	
1248. Elevator indicators - show full down.						07			01	2	2	1	
1249. Control wheel - full aft.						08			01	2	1	1	
1250. Elevator indicators - show full up.						09			01	2	2	1	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
1251.	Control wheel - neutral.	13	40	09	13	40	10			01	2	1	1	
1252.	Elevator indicators - show neutral.						11			01	2	2	1	
1253.	Nose wheel steering wheel - hold in neutral (Capt).						12			01	3	1	1	
1254.	Rudder pedals - full left.						13			01	3	1	1	
1255.	Top & bottom rudder indicators - full left.						14			01	3	2	1	
1256.	Rudder pedals - full right.						15			01	3	1	1	
1257.	Top & bottom rudder indicators - full right.						16			01	3	2	1	
1258.	Rudder pedals - neutral.						17			01	3	1	1	
1259.	Rudder indicators - neutral.						18			01	3	2	1	
1260.	Capt. & F.O.'s instruments - normal operation in turns.						19			01	3	2	1	
1261.	VOR radios 1 & 2 - recheck frequencies (117.0).						20			01	3	1	1	
1262.	VOR course selectors - recheck (072°).						21			01	3	1	1	
1263.	FGS altitude selector - confirm set to 10,000' (1st alt.).						22			01	3	1	1	
1264.	Altitude selector - pull out.						23			01	3	1	1	
1265.	FGS arm annunciator - shows ALT.						24			01	3	2	1	
1266.	FGS annunciators - read blank, ALT, TAKE OFF & TAKE OFF.						25			01	3	2	1	
1267.	APU generator bus switches - off (S.O.).						26			01	2	1	1	
1268.	APU master switch - off.						27			01	2	1	1	
1269.	All engine N2 RPM - above 60% (sometime prior to take off).						28			01	3	1	1	
1270	All generator frequencies - check below 420 hz.						29			01	2	1	2	
1271.	All systems monitor - Second Officer. (through take off and climb).	13	40	29	14	06	00		25	41	--	--	--	
1272.	Spoiler handle - pull up to arm.	13	40	29	13	40	30			01	2	1	2	
1273.	Spoiler do not use light - off.						31			01	2	2	2	
1274.	Engine ignition switch - continuous B (even numbered trip).						32			01	2	1	2	
1275.	Anti skid switch - armed.						33			01	3	1	2	
1276.	Anti skid fail lights - off.						34			01	3	1	2	
1277.	Cabin call chime - sounds.						35			01	2	1	3	
1278.	Galley no longer occupied report - first flight attendant.						40			05	2	1	3	
1279.	Response to FFA - Second Officer (on hand set).						45			05	2	1	2	
1280.	Galley no longer occupied report - relayed to Captain.						48			03	3	1	2	
1281.	Before take off checklist - commanded by Captain.						50			02	3	1	2	
1282.	Before take off checklist - read by S.O., response as appropr.						53			03	2	1	2	
1283.	APU isolation valve - closed (S.O.).						56			03	2	1	3	
1284.	Tank pumps - all aft pumps on (S.O.).						59			03	2	1	3	
1285.	Motor pumps and rudder standby power - armed (S.O.).					41	02			03	3	1	3	
1286.	Pitot heat - on (F.O.).						05			03	3	2	2	
1287.	Engine anti ice - off (F.O.).						08			03	3	2	2	
1288.	Ignition - continuous B (F.O.).						11			03	3	2	2	
1289.	Anti skid - armed (F.O.).						14			03	3	2	2	
1290.	Altitude - 10,000' set Capt & F.O.).						17			03	3	2	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL			REMARKS
											CAP.	F.O.	S.O.	
1291.	Flight & NAV instruments - checked and set (Capt & F.O.).	13	41	17	13	41	20			03	3	2	2	
1292.	Flaps - tapes 5, take off light, detent (F.O.).						23			03	3	2	2	
1293.	V speeds - set (Capt & F.O.).						26			03	3	2	2	
1294.	Controls checked (F.O.).						29			03	2	2	2	
1295.	Trim - 3 set (F.O.).						32			03	2	2	2	
1296.	Fuel levers - on, detent (F.O.).						35			03	2	2	2	
1297.	Spoilers - armed (F.O.).						38			03	2	2	2	
1298.	Seat power - off (Capt, F.O., S.O.).						41			03	3	2	2	
1299.	APU - off (S.O.).						44			03	2	1	3	
1300.	Annunciator lights - off (S.O.).						47			03	2	1	2	
1301.	Announcement - checklist complete down to the line (S.O.).						50			03	2	1	2	
1302.	VHF radio - tuned to 119.5 (freq from ground control).						55			05	2	1	2	
1303.	Take off clearance - request (F.O.).						56			01	2	1	2	
1304.	Tower response - cleared for take off, 35 right.						58			02	4	2	2	
1305.	Wind - 20°/7 knots.						59			01	4	2	2	
1306.	First Officer response - cleared for take off.					42	00			01	4	1	2	
1307.	Final checklist items commended - Captain.						02			02	4	1	3	
1308.	Response - transponder - on (F.O. & S.O.).						04			02	4	2	3	
1309.	Announcement - checklist complete (S.O.(.						05			01	3	1	3	
1310.	Hand set - picked up (S.O.).						10			05	2	1	3	
1311.	PA switch - press.						11			01	2	1	3	
1312.	Cabin announcement - cleared for take off.						14			03	2	1	3	
1313.	Flight attendants - prepare for take off.						15			01	2	1	3	
1314.	Runway turn off lights - on (Capt).						16			01	4	1	2	
	TAKE OFF													
1315.	Throttles - advance (Capt).	13	42	16	13	42	21			05	3	2	2	
1316.	Nose wheel steering - align with runway.						26			05	3	2	2	
1317.	Throttles - set N1 approx. 100.2% (Capt).						29			03	3	2	2	
1318.	Throttles - fine adjust to 100.2% (S.O.).						31			02	3	2	3	
1319.	Engine instruments - monitor (S.O., N1 may decrease 2%).						33			02	2	2	3	
1320.	Take off steering - by rudder pedals.						35			02	3	2	2	
1321.	Airspeed - increasing to V1 (139).						52			17	3	2	2	
1322.	V1 - announcement (F.O.).						53			01	3	3	2	
1323.	Airspeed - increasing to VR (144).						58			05	3	2	2	
1324.	VR - announcement (F.O.).						59			01	3	3	2	
1325.	Control wheel - aft to rotate (Capt).					43	00			01	3	2	2	
1326.	Pitch attitude - establish approx. 15° nose up.						02			02	4	2	2	
1327.	Pitch command bar - center (Capt).	13	43	02	13	46	30		03	28	--	--	--	
1328.	Airspeed indicator - shows approx 164 knots (V2 +10).	13	43	02	13	43	03			01	3	3	2	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
1329.	Steer command bar - center (Capt).	13 43 02	13 46 30	03 28	--	--	--	
1330.	Course indicator - shows approx. 350°.	13 43 00	13 43 03	03	--	--	--	
1331.	Vertical speed - indicates downward momentarily.		03	--	--	--	--	
1332.	Vertical speed - moves to positive indication.		04	01	4	3	3	
1333.	Positive rate - announcement(F.O.).		05	01	4	3	3	
1334.	Gear up - commanded (Capt).		07	02	4	3	3	
1335.	Gear handle - up position (F.O.).		10	03	4	3	3	
1336.	ACARS send light - on (sending off time).		10	--				
1337.	Gear indicator lights (green) - off.		11	01	4	3	3	
1338.	Gear indicator lights (red) - on.		12	01	4	3	3	
1339.	#3 hydraulic quantity - increasing (about 1 gal.).		14	02	4	2	3	
1340.	Gear indicator lights - off.		15	01	4	2	3	
1341.	Gear handle - move to blue dot (F.O.).		16	01	4	3	2	
1342.	Red gear indicator lights - off (after 5-10 secs).		21	05	4	3	3	
1343.	Gear handle - up.		23	02	4	3	3	
1344.	Thrust computer climb mode - select (shows 98.2% limit).		24	01	4	3	3	
1345.	Altitude - increasing to 6,330' (1,000'AG).		25	01	4	3	3	
1346.	1,000 fpm - commanded (Capt).		26	01	5	4	3	
1347.	Vertical speed wheel - 1,000 fpm up (F.O.).		28	02	4	3	3	
1348.	Vertical speed indicator - 1,000 fpm up.		29	01	4	3	3	
1349.	Airspeed - increasing.		30	01	4	2	3	
1350.	FCS mode annunciators - blank, ALT, HDG HOLD, VERT SPD.		31	01	4	2	3	
1351.	Airspeed - check above 158 knots (flap retract speed).		33	02	4	3	3	
1352.	Flaps zero - commanded (Capt).		35	02	5	3	3	
1353.	Flap/slat handle - zero/extend (F.O.).		38	03	4	3	3	
1354.	Flap indicator tapes - move up to zero.		43	05	4	3	3	
1355.	Climb thrust, auto throttles on, N1 - commanded - Captain.		45	02	5	3	3	
1356.	N1 mode selector - hold in (F.O.).		47	02	4	3	3	
1357.	Auto throttles 1 & 2 - engage.		48	01	4	3	3	
1358.	N1 mode selector - release.		49	01	4	3	3	
1359.	Auto throttle mode annunciator - shows N1.		51	02	4	3	3	
1360.	Auto throttles - adjust to approx 98.2% (thrust computer/bugs).		54	03	4	3	3	
1361.	Airspeed - increasing through 189 knots (slat retract speed).		59	01	4	3	3	
1362.	Slats retract - commanded (Capt).	44	00	01	5	3	3	
1363.	Flap/slat handle - up/retract (F.O.).		02	02	4	3	2	
1364.	Slat take off light - out.		07	05	4	3	3	
1365.	Slat disagree light - on then off.		12	05	4	3	3	
1366.	Airspeed - increasing through 204 knots (maneuvering speed).		42	30	4	3	2	
1367.	Bank selector - 25°.		44	02	5	2	2	
1368.	Airspeed - increasing to 224 knots (climb speed to 3,000' AG).		50	06	4	3	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
1369.	Indicated airspeed hold - commanded (Capt).	13	44	50	13	44	52			02	5	3	2	
1370.	IAS hold selector - press (F.O.).						54			02	4	3	2	
1371.	Pitch bar - center (Capt).						56			02	4	3	2	
1372.	Airspeed - remains at 224 knots.					45	01			05	4	3	2	
1373.	FGS pitch annunciator - reads IAS HOLD.						03			02	4	3	2	
1374.	Clearance to departure control - Denver tower.						05			02	5	4	2	
1375.	Departure control frequency - 128.05.						06			01	4	4	2	
1376.	Frequency change - acknowledge (F.O.).						08			02	4	4	2	
1377.	VHF radio 1 - tune to 128.05.						10			02	4	4	2	
1378.	Denver departure - contact.						12			02	4	3	2	
1379.	Climbing to 10,000'.						15			03	4	3	2	
1380.	Contact - acknowledged.						18			03	4	3	2	
1381.	Clearance - right turn to 100° to intercept 072° radial.						21			03	5	4	2	
1382.	Clearance - acknowledged (F.O.).						25			04	5	4	2	
1383.	Heading select knob - pull out.						26			01	5	4	2	
1384.	FGS steer annunciator - shows HDG SEL.						27			01	4	4	2	
1385.	Steer bar - commands right turn.						28			01	5	3	2	
1386.	Steer bar-centered (Capt).						29			01	5	3	2	
1387.	Airplane - turns to previously selected 100°.	13	45	29	13	45	59			30	--	--	--	
1388.	Altitude - passing 7,300' (approx. 2,000' AG).	13	45	29	13	45	30			01	4	3	2	
1389.	Seat belt switch - auto.						32			02	4	4	2	
1390.	No smoking switch - auto.						34			02	4	4	2	
1391.	Cabin announcement commanded - Captain.						35			01	5	3	3	
1392.	Hand set - pick up (S.O.).						38			03	4	3	3	
1393.	PA switch - press.						40			02	4	3	3	
1394.	Cabin announcement - no smoking signs off.						43			03	4	3	3	
1395.	Seat belt signs - off.						46			03	4	3	3	
1396.	Smoking - in designated areas only.						50			04	4	3	3	
1397.	Seat belts - recommended if in seats.						54			04	4	3	3	
1398.	Altitude - 8,300' (3,000' AG).					46	00			06	4	3	2	
1399.	Acceleration to 250 knot climb speed - begin.						01			01	5	3	2	
1400.	Vertical speed 1.000 fpm up - commanded (Capt).						02			01	5	4	2	
1401.	Vertical speed selector - set to 1,000 fpm up (F.O.).						03			01	4	4	2	
1402.	FGS pitch annunciator - shows VERT SPD.						04			01	4	3	2	
1403.	Pitch bar - commands lower pitch angle for acceleration.						05			01	4	3	2	
1404.	Pitch bar - centered (Capt).						07			02	4	3	2	
1405.	Vertical speed indicator - shows 1,000 fpm up.						08			01	4	3	2	
1406.	Airspeed - increasing toward 250 knots.						25			17	4	3	2	
1407.	At 250 knots, IAS hold - commanded (Capt).						26			01	5	3	2	
1408.	IAS hold selector - press (F.O.).						27			01	5	4	2	

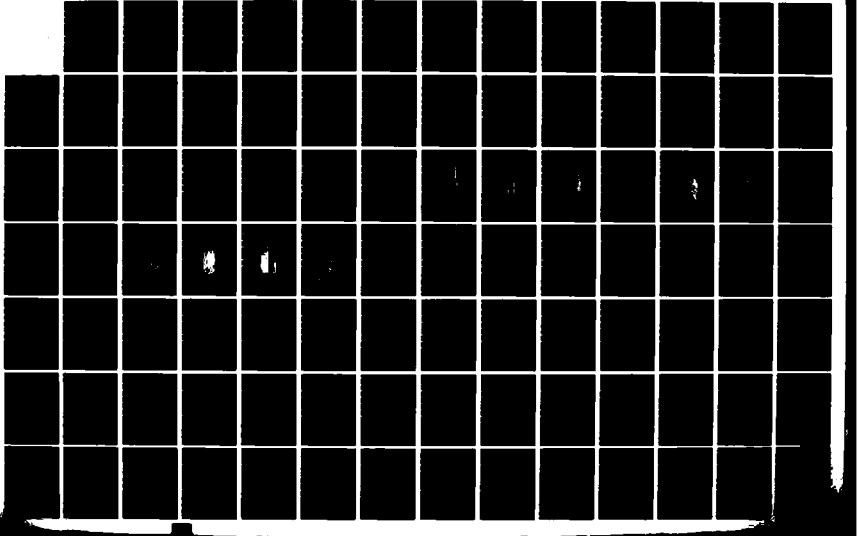
	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
1409.	Pitch annunciator - shows IAS HOLD.	13 46 27	13 46 28	01	4	4	2	
1410.	Pitch command bar - commands 250 knots.		29	01	4	3	2	
1411.	Auto pilot #1 - engage (Capt).		30	01	5	3	2	
1412.	Auto pilot - maintains engaged modes.	13 46 30	14 35 00	48 30	--	--	--	
1413.	NAV selector - press (Capt).	13 46 30	13 46 45	15	5	3	2	
1414.	FGS annunciator arm window - shows VOR & ALT.		50	05	4	3	2	
1415.	Spoiler handle - disarm.		55	05	3	3	3	
1416.	Ignition switch - off.		47 00	05	3	3	3	
1417.	Pressurization - checked (S.O.).		30	30	3	2	3	
1418.	Vane heat - 1.6 amps. minimum (S.O.).		39	09	3	2	3	
1419.	After take off checklist - commanded (Capt).		40	01	4	2	3	
1420.	After take off checklist completed silently (S.O.).		41	01	4	2	3	
1421.	Main landing gear door uplatch - checked.		42	01	4	2	3	
1422.	Spoilers - disarmed.		43	01	4	2	3	
1423.	Flaps & slats - up, no lights.		44	01	3	2	3	
1424.	Gear - up, no lights.		45	01	3	2	3	
1425.	Ignition -off.		46	01	3	2	3	
1426.	Vane heat - checked.		47	01	3	2	3	
1427.	Announcement check list complete - Second Officer.		49	02	4	2	3	
1428.	Acknowledgement - Captain.		50	01	4	2	3	
1429.	Cabin altitude - maintaining 5,330'.		52	02	4	2	2	
1430.	Cabin vertical speed - zero.		53	01	3	2	2	
1431.	Cabin differential pressure - increasing.		55	02	3	2	2	
1432.	Radio call - Denver departure.		57	02	3	3	2	
1433.	Acknowledged - First Officer.		58	01	3	3	2	
1434.	Clearance to Denver center 125.95 - Denver departure.		48 00	02	4	3	2	
1435.	Acknowledge clearance - First Officer.		01	01	4	3	2	
1436.	VHF radio 1 - tune to 125.95.		03	02	3	3	2	
1437	Denver center - contact (F.O.).		04	01	3	3	2	
1438.	Climbing - to flight level 10,000' (F.O.).		05	01	3	3	2	
1439.	Contact acknowledged - Denver center.		06	01	4	3	2	
1440.	United 280 - in radar contact.		07	01	1	3	2	
1441.	Altitude - 9,250'.		07	--				
1442.	Altitude alert light - on (approaching 10,000' armed altitude).		08	01	4	2	2	
1443.	Altitude - 9,750'.		09	01	4	2	2	
1444.	Altitude alert light 0 off.		09	--				
1445.	Altitude capture mode - engages.		10	01	4	2	2	
1446.	FGS arm annunciator - shows only VOR.		11	01	4	2	2	
1447.	FGS pitch annunciator - shows ALT CAP.		12	01	4	2	2	
1448.	Altitude - 10,000'.		13	01	4	2	2	

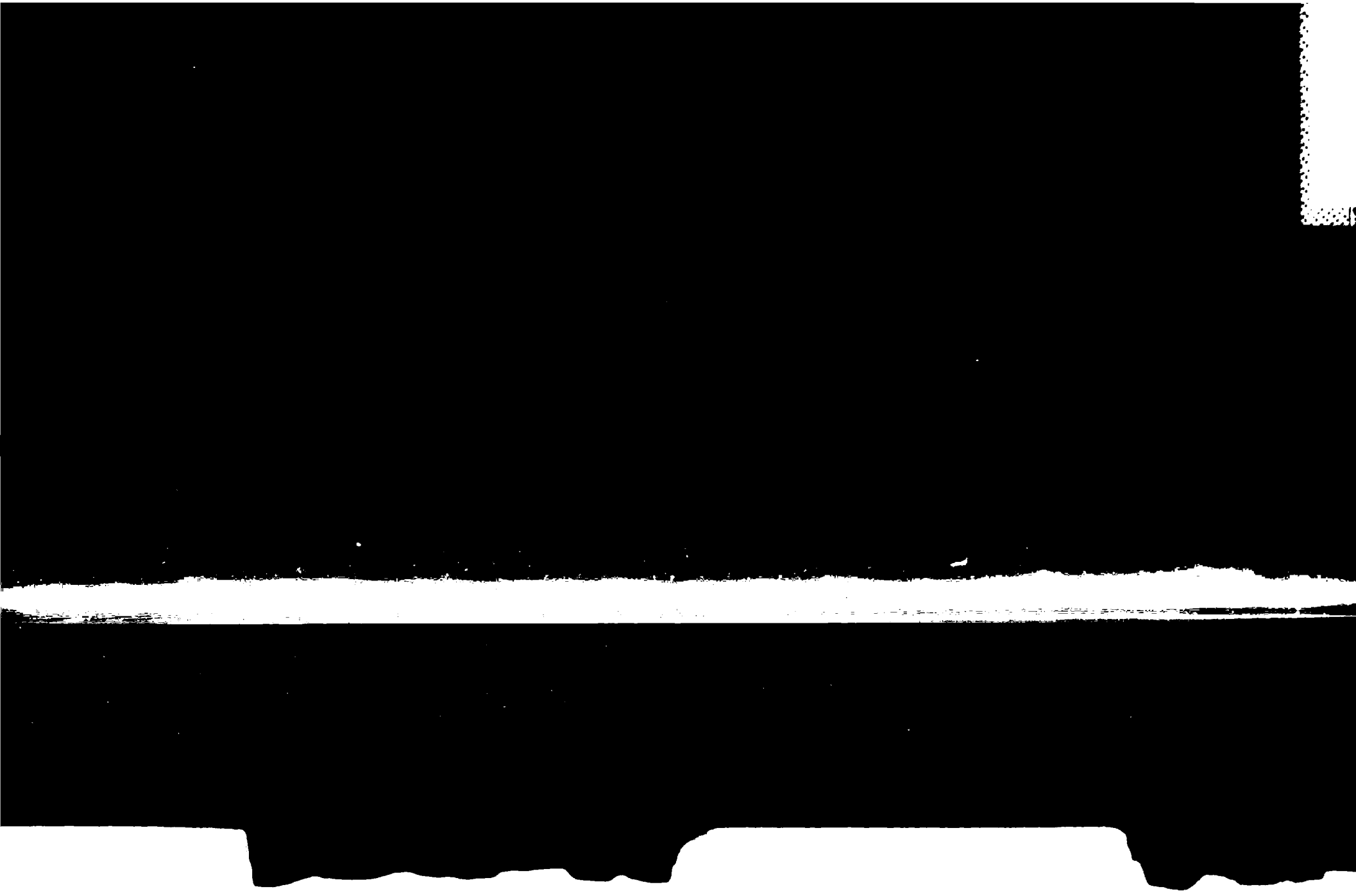
	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
1449.	Altitude hold mode - engages.	13	48	13	13	48	15			02	4	2	2	
1450.	FGS pitch annunciator - shows ALT HOLD.						16			01	4	2	2	
1451.	Airspeed - increasing (level off with no thrust reduction).						19			03	4	2	2	
1452.	Speed selector - set to 300 knots (Capt. climb speed above 10,000').						22			03	4	2	2	
1453.	Airspeed - 300 knots.						24			02	4	2	2	
1454.	Speed selector - pull out (auto throttles will hold climb speed).						25			01	4	2	2	
1455.	FGS auto throttle annunciator - shows SPD.						26			01	4	2	2	
1456.	Cabin vertical speed and altimeter - show cabin slowly descending.						29			03	4	2	2	
	CLIMB													
1457.	Distance from Denver - 15 nm (DME/radar).	13	48	29	13	48	30			01	4	2	2	
1458.	Radio call - Denver center.						32			02	3	2	2	
1459.	Acknowledge call - First Officer.						33			01	3	3	2	
1460.	Clearance - to flight level 20.0 (Denver center).						35			02	4	3	2	
1461.	Clearance - acknowledged (F.O.).						36			01	4	3	2	
1462.	Thrust computer N1 selector - press.						39			03	4	2	2	
1463.	Throttles - advance to climb thrust setting.						44			05	3	2	2	
1464.	IAS button - press (Capt).						46			02	4	2	2	
1465.	FGS pitch annunciator - shows IAS HOLD.						47			01	3	2	2	
1466.	Auto pilot - maintains 300 knots, with pitch attitude.	13	48	47	14	03	30		14	46	--	--	--	
1467.	Vertical speed - increases.	13	48	47	13	48	49			02	3	2	2	
1468.	Altitude selector - set to 20,000'.						51			03	4	2	2	
1469.	Altitude selector - pull out to arm for capture.						53			01	4	2	2	
1470.	FGS annunciator - again shows both VOR & ALT.						55			02	3	2	2	
1471.	VOR radial - interception (FGS).					52	00		03	05	3	2	2	
1472.	FGS steer annunciator - shows VOR CAP.						02			02	3	2	2	
1473.	Steer command bar - commands a left turn.						04			02	3	2	2	
1474.	FGS arm annunciator - shows ALT only.						06			02	3	2	2	
1475.	Autopilot - steers airplane to the left.						16			10	3	2	2	
1476.	FGS - monitored by Captain & First Officer.						18			02	3	2	2	
1477.	Course deviation bar (HSI) - nears center.						20			02	3	2	2	
1478.	Auto pilot - rolls out airplane on center of 072° radial.						22			02	3	2	2	
1479.	Course bar - centered.						24			02	3	2	2	
1480.	Steer command bar - commands level out on course.						28			02	3	2	2	
1481.	FGS steer annunciator - shows VOR TRK.						30			02	3	2	2	
1482.	FGS - monitored by pilots.						34			04	3	2	2	
1483.	Altitude - 18,000'						49			15	3	2	2	
1484.	Altimeter baro set knob - set 29.92 hg (Capt., F.O.).						53			04	3	2	2	
1485.	Runway turn off lights - off (Capt).						55			02	4	3	2	
1486.	Engine #2 bleed air switch - off (S.O.).						58			03	4	2	2	

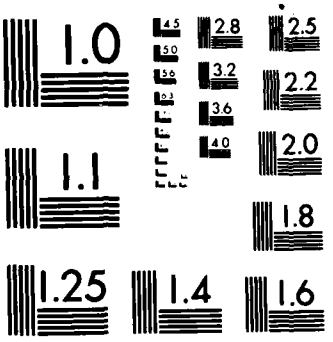
	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
1487.	Pack indicator selector - pack 2.	13	52	58	13	53	00			02	4	2	3	
1488.	Pack 2 selector switch - manual hot and hold.						15			15	3	2	3	
1489.	pack temperature valve position - full hot.						17			02	3	2	3	
1490.	Pack 2 selector switch - off.						19			02	3	2	3	
1491.	1-2 isolation valve switch - open.						21			03	3	2	3	
1492.	1-2 isolation valve disagree light - on then off.						24			03	3	2	3	
1493.	#1 engine bleed air switch - off.						26			02	3	2	3	
1494.	#2 engine bleed air switch - auto.						29			03	3	2	3	
1495.	Cabin altimeter - still slowly descending.						44			15	3	2	2	
1496.	Cabin vertical speed indicator - slow rate of descent.						46			02	3	2	2	
1497.	Radio call - Denver center.						48			02	3	3	2	
1498.	Acknowledged radio call - First Officer.						50			02	3	3	2	
1499.	Clearance to next sector 135.5 - Denver center.						52			02	4	3	2	
1500.	Acknowledge clearance - First Officer.						54			02	3	3	2	
1501.	VHF radio 1 - tune to 135.5 (F.O.).						57			03	3	3	2	
1502.	Denver center contact - First Officer.					54	00			03	3	3	2	
1503.	Climbing - to flight level 20.0.						03			03	3	3	2	
1504.	Contact - acknowledged (Denver center).						06			03	3	3	2	
1505.	Clearance to continue climb to flt level 37.0 - DEN center.						11			05	4	3	2	
1506.	Acknowledge clearance - First Officer.						14			03	3	3	2	
1507.	Captain - notify of clearance to 20.0 (F.O.).						19			05	4	3	2	
1508.	Altitude selector - set to 37,000' (capt/F.O.).						22			03	4	3	2	
1509.	Altitude selector - pull out.						25			03	4	3	2	
1510.	Enrout high altitude chart - consult (Capt).						30			05	4	2	2	
1511.	First Officer - instructed to help load waypoints in INS (Capt).						38			08	4	3	2	
1512.	INS remote buttons 1 & 2 - press.						43			05	4	3	2	
1513.	Remote key lights - on.						45			02	4	3	2	
1514.	Data selectors 1 & 2 - way point.						50			05	4	3	2	
1515.	Way point selectors 1 & 2 - way point 2.					55	00			10	4	3	2	
1516.	Hayes Center lat. N40°27.2' - read by Captain.						15			15	4	3	2	
1517.	N40°27.2' - keyed in (F.O.).						20			05	4	3	2	
1518.	N40°27.2' - display confirmed (Capt).						23			03	3	3	2	
1519.	Insert key - press (F.O.).						25			02	4	2	2	
1520.	Insert key light - off.						27			02	3	3	2	
1521.	Hayes Center long. - W100°55.4' - read by Captain.						42			15	3	2	2	
1522.	W100°55.4' - keyed in (F.O.).						47			05	4	3	2	
1523.	W100°55.4' - display confirmed (Capt).						50			03	3	3	2	
1524.	Insert key - press (F.O.).						52			02	4	3	2	
1525.	Insert key light - off.						53			01	3	3	2	
1526.	Way point selectors - way point 3.					56	03			10	3	2	2	

AD-A140 643 COCKPIT DATA MANAGEMENT REQUIREMENTS (CURRENT TECHNOLOGY AIRCRAFT)(U) ARINC RESEARCH CORP ANNAPOLIS MD T P BERRY OCT 83 1378-03-8-3150 DOT/FAA/PM-83/25 3/4

UNCLASSIFIED DTFA01-80-C-10030 F/G 1/3 NL







MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
1527.	Wolbach Lat. N 41°22.5' - read by Captain.	13 56 03	13 56 18	15	4	3	2	
1528.	N41°22.5' - keyed in (F.O.).		23	05	4	3	2	
1529.	N41°22.5' - display confirmed (Capt).		26	03	3	3	2	
1530.	Insert key - press (F.O.).		28	02	4	2	2	
1531.	Insert key light - off		29	01	3	3	2	
1532.	Wolbach long. W98°21.2' - read by Captain.		44	15	3	2	2	
1533.	W98°22.5' - keyed in (F.O.).		49	05	4	3	2	
1534.	W98°22.5' - display confirmed (Capt).		52	03	3	3	2	
1535.	Insert key - press (F.O.).		54	02	4	2	2	
1536.	Insert key light - off.		55	01	3	3	2	
1537.	Way point selectors 1 & 2 - way point 4.		57 05	10	3	2	2	
1538.	Dubuque lat. N42°24.1' - read by Captain.		20	15	4	3	2	
1539.	N42°24.1' - keyed in (F.O.).		25	05	4	3	2	
1540.	N42°24.1' - display confirmed (Capt).		28	03	3	3	2	
1541.	Insert key - press (F.O.).		30	02	4	3	2	
1542.	Insert key light - off.		31	01	3	3	2	
1543.	Dubuque long. W90°42.5' - read by Captain.		46	15	3	2	2	
1544.	W90°42.5' - keyed in (F.O.).		51	05	3	3	2	
1545.	W90°42.5' - display confirmed (Capt).		54	03	4	2	2	
1546.	Insert key - press (F.O.).		56	02	3	3	2	
1547.	Insert key light - off.		57	01	3	2	2	
1548.	Remote keys 1 & 2 - press.		59	02	3	3	2	
1549.	Remote key lights - off.		58 00	01	3	2	2	
1550.	Cabin altimeter and vertical speed - show climbing on sched.		01	01	3	2	3	
1551.	Cruise indicated airspeed - requested (Capt).		02	01	4	2	3	
1552.	Low and high buffet speeds - " .		04	02	4	2	3	
1553.	Flight level suitability for weight - req. (Capt).		06	02	4	2	3	
1554.	Fuel consumption rate - req. (Capt).		08	02	4	2	3	
1555.	Flight hand book - consulted (S.O.).		21	13	3	2	3	
1556.	Airplane gross weight 335,000# - gross weight indicator.		31	10	3	2	3	
1557.	Equivalent gross weight 500.000# (1.5 accel. vs 335,000, buffet chart).		46	15	3	2	3	
1558.	Rough air penetration speed - .80 to .85 mach (hand book).		56	10	3	2	3	
1559.	Low buffet speed - 242 kts (equiv wt vs altitude, hand book).		59 11	15	3	2	3	
1560.	High speed buffet - 280 kts "		26	15	3	2	3	
1561.	High/low speed margin - 38 kts.		41	15	3	2	3	
1562.	Cruise indicated speed - 270 kts (.83 mach, gr wt vs alt).		56	15	3	2	3	
1563.	True airspeed - 475 kts (gr wt vs alt).		14 00	10 14	3	2	3	
1564.	N1 RPM - 96.9% (gr wt vs alt).		20	10	3	2	3	
1565.	Fuel flow - 4755#/hr/eng (gr wt vs alt).		50	30	3	2	3	
1566.	Cruise information - transcribed and handed to Captain (S.O.).		01 00	10	4	2	3	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
1567.	DME mileage - 121 DEN VOR DME.	13	34	00	14	03	00			--	--	--	--	
1568.	VOR radios 1 & 2 - tune Hayes Center VOR 117.7 (enroute map).	14	01	00	14	03	03		02	03	3	3	2	
1569.	VOR course mode - engages (with loss of VOR signal).						04			01	3	2	2	
1570.	FGS steer annunciator - shows VOR CRS.						05			01	3	2	2	
1571.	Auto pilot - maintains approx. 072° (CRS mode parallels selec. course).						06			01	3	2	2	
1572.	Course selectors - set to 055° (inbound course to HCT).						08			02	3	2	2	
1573.	Auto pilot - turns left to parallel 055° course.						15			07	3	2	2	
1574.	Mach/airspeed indicator - .82 mach (about flt lvl 31.7).						28			13	3	2	2	
1575.	Mach hold selector - press (Capt).						30			02	4	2	2	
1576.	FGS pitch annunciator - shows MACH HOLD.						32			02	4	3	2	
1577.	FGS - self tests for useable VOR signal.					05	05		01	37	3	2	2	
1578.	FGS VOR track mode - engages.						07			02	3	2	2	
1579.	FGS steer annunciator - shows VOR TRK.						08			01	3	2	2	
1580.	Chicago weather - requested by Captain.						10			02	4	2	3	
1581	ACARS VOX mode - selected (S.O.).						14			04	3	2	3	
1582.	Enroute chart or POH - consult for flight watch freq (S.O.).						17			03	3	2	3	
1583.	VHF radio 2 - tune to 122.0 (flight watch).						20			03	3	2	3	
1584.	Denver flight watch - contact.						21			01	3	2	3	
1585.	Acknowledge contact - Denver flight watch.						22			01	3	2	3	
1586.	Chicago weather for 15:30 - requested (S.O.).						25			03	3	2	3	
1587.	Flight watch response - stand by.						28			03	3	2	3	
1588.	Altitude - 36,000' increasing.						29			01	3	2	2	
1589.	1,000' below assigned altitude call - First Officer.						31			02	3	3	2	
1590.	Acknowledge call - Captain.						32			01	4	2	2	
1591.	Cabin altitude - increasing through 5,550' (approx.) on sched.						33			01	3	2	2	
1592.	Radio call - Denver flight watch.						35			02	3	2	3	
1593.	Acknowledge radio call - Second Officer.						37			02	3	2	3	
1594.	Chicago 15:30 weather - 2300 broken,						39			02	3	2	3	
1595.	- 9,000 overcast,						40			01	3	2	3	
1596.	- 4 miles in haze,						41			01	3	2	3	
1597.	temperature - 72°,						42			01	3	2	3	
1598.	wind - 160°, 11 knots, gusts to 22.						43			01	3	2	3	
1599.	Acknowledge weather - Second Officer.						44			01	3	2	3	
1600.	Altitude - 36,250'.						45			01	3	3	2	
1601.	Altitude alert light - on.						46			01	3	3	2	
1602.	ACARS data mode - select (S.O.).						48			02	3	2	3	
1603.	Weather information - pass to Captain.						49			01	4	2	3	
1604.	Hand set - pick up (Capt).						52			03	4	2	2	
1605.	PA switch - press.						54			02	4	2	2	
1606.	Cabin announcement - approaching cruise altitude, 37,000',						56			02	4	2	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
1607.	- expect on time arrival,	14	05	56	14	05	58			02	4	2	2	
1608.	Chicago temperature - 76°,					06	00			02	4	2	2	
1609.	wind - gusty, sky cloudy &						02			02	4	2	2	
1610.	flight should be smooth.						04			02	4	2	2	
1611.	Altitude - 36,750'.						14			10	3	2	2	
1612.	Altitude alert light - off.						15			01	3	2	2	
1613.	Altitude capture mode - engages.						17			02	3	2	2	
1614.	FGS arm annunciator - goes blank.						18			01	3	2	2	
1615.	FGS pitch annunciator - shows ALT CAP.						19			01	3	2	2	
1616.	Auto pilot - begins level off.						20			01	3	2	2	
1617.	Altitude - 37,000'.						28			08	3	2	2	
1618.	Altitude hold mode - engages.						29			01	3	2	2	
1619.	FGS pitch annunciator - shows ALT HOLD.						30			01	3	2	2	
1620.	Cabin altitude - levels at 6,200'.						31			01	3	2	2	
1621.	Speed selector knob - set to 270 knots (Capt).						33			02	3	2	2	
1622.	Speed selector knob - pull out.						34			01	4	2	2	
1623.	Auto throttles - adjust to hold 270/.83 mach.						35			01	3	2	2	
1624.	FGS auto throttle annunciator - shows SPD.						36			01	3	2	2	
1625.	Thrust computer cruise button - press (Capt).						37			01	4	2	2	
1626.	N1 thrust limit bugs - move to thrust limit shown on computer.						39			02	3	2	2	
	CRUISE PROCEDURES													
1627.	N1 RPM - approx. 96.9% (below cruise limit).	14	06	40	15	07	00	01	00	20				S.O. action level to be included on subsequent pages with pilot crew members.
1628.	N1 cruise limit - 98.4% (charts & thrust computer).													
1629.	EGT - normal (not over 875°C).													
1630.	N2 - approx. 89.5% (not over the red line).													
1631.	Fuel flow - normal (around 4,500#/hr).													
1632.	Hydraulic temperature - normal (may be as low as 0°C).													
1633.	Hydraulic quantity systems 1 & 2 - even with reminder bugs.													
1634.	Hydraulic system 3 - approx. 1 gallon over the bug.													
1635.	Hydraulic pressure systems 1, 2 & 3 - approx. 3,000 psi.													
1636.	CSD low oil pressure lights - off.													
1637.	CSD outlet temperature - below the yellow band.													
1638.	CSD push for rise button - press.													
1639.	CSD rise temperature - below the yellow band.													
1640.	Generator fail lights - off.													
1641.	Generator off lights - off.													
1642.	AC loads - normal (below 1.0).													
1643.	Left and right emergency bus off lights - off.													
1644.	Dual load selected & power on lights - off.													
1645.	AC bus 1, 2 & 3 off lights - off.	14	06	40	15	07	00	01	00	20				

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL			REMARKS
											CAP.	F.O.	S.O.	
1646.	AC bus tie isolate lights - off.	14	06	40	15	07	00	01	00	20				
1647.	Emergency power in use light - Off.													
1648.	DC loads - normal (below 1.0).													
1649.	Left & right DC emergency bus off lights - off.													
1650.	DC bus 1, 2 & 3 bus off lights - off.													
1651.	DC tie switches - open position.													
1652.	DC 1 & 3 tie closed lights - Off.													
1653.	DC x-tie closed light - off.													
1654.	Battery switch - on and locked.													
1655.	Battery bus off light - off.													
1656.	APU - shut down, lights off.													
1657.	Volt/amp/freq selector - battery & left emergency bus.													
1658.	AC volts - 115.													
1659.	AC frequency - 400 hz.													
1660.	Battery volts - in the green band.													
1661.	Galley bus switches - on.													
1662.	Galley 1, 2 & 3 power off lights - off.													
1663.	Coffee bar switch - on.													
1664.	Coffee bar power off light - off.													
1665.	Galley overheat light - off.													
1666.	Fuel schedule lights - off.													
1667.	Fill valve open lights - off.													
1668.	Fuel quantity gages - approx. even.													
1669.	Tank pump pressure low lights - off.													
1670.	Fuel temperature - above -36°C.													
1671.	Fuel x-feed valve switches - closed.													
1672.	X-feed disagree lights - off.													
1673.	Fuel pressure indicators - normal range.													
1674.	Fuel used indicators - show normal usage.													
1675.	Fuel dump valve switch - closed.													
1676.	#2 & 3 Engine bleed switches - auto.													
1677.	# 1 engine bleed switch - off.													
1678.	#1, 2 & 3 manifold fail lights - off.													
1679.	#1, 2 & 3 temperature high lights - off.													
1680.	#1, 2 & 3 high stage open lights - off.													
1681.	#1 temperature indicator - low.													
1682.	#2 & 3 temperature indicators - normal.													
1683.	APU isolation valve - closed.													
1684.	#1, 2 & 3 system pressures - normal.													
1685.	1-2 isolation valve switch - open.	14	06	40	15	07	00	01	00	20				

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
1686.	1-2 isolation disagree light - off.	14	06	40	15	07	00	01	00	20				
1687.	1-3 isolation valve switch - normal.													
1688.	1-3 isolation disagree light - off.													
1689.	Wing anti ice switch - off.													
1690.	Wing anti ice disagree lights - off.													
1691.	#1 & 3 flow meters - normal range.													
1692.	#2 flow meter - low.													
1693.	#1 & 3 pack switches - auto.													
1694.	#2 pack switch - off.													
1695.	Pack indicator selector - pack 1.													
1696.	Turbine inlet temperature - normal.													
1697.	Pack temperatur valve position - normal range.													
1698.	Pack discharge temperature - normal.													
1699.	Pack indicator selector - pack 2.													
1700.	Turbine inlet temperature - cold.													
1701.	Pack temperature valve position - full hot.													
1702.	Pack discharge temperature - cold.													
1703.	Pack indicator selector - pack 3.													
1704.	Turbine inlet temperature - normal.													
1705.	Pack temperature valve position - normal range.													
1706.	Pack discharge temperature - normal.													
1707.	Pack off lights - off.													
1708.	Cockpit, galley and cabin temperature selectors - auto.													
1709.	Duct temperatures - normal range.													
1710.	Cockpit, galley and cabin temperatures - comfort range.													
1711.	Trim air switch - on.													
1712.	Duct/avionic compartment overheat light - off.													
1713.	Cargo fire warning lights - off.													
1714.	Smoke and heat detector lights - off.													
1715.	Cargo compartment agent low lights - off.													
1716.	Lav/galley vent and cargo heat switch - on.													
1717.	Cargo compartment temperatures - normal.													
1718.	Oxygen mask eject switch - safetied.													
1719.	Oxygen quantity gage - 1650 psi.													
1720.	Oxygen line pressure - white band.													
1721.	Cabin altitude rate - zero.													
1722.	Cabin altitude - approx. 6,200'													
1723.	Cabin differential pressure - 8.6 psi (white band).													
1724.	Cabin altitude warning light - off.													
1725.	Cabin pressure relief open light - off.	14	06	40	15	07	00	01	00	20				

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL			REMARKS
											CAP.	F.O.	S.O.	
1726.	Master caution and warning lights - off. ----------	14	06	40	15	07	00	01	00	20				
1727.	Second Officer's annunciator panel lights - off.													
1728.	Engine and APU loop selector switches - all in both.													
1729.	Engine fire detector loop lights - off.													
1730.	Engine oil quantity gages - indicate at reminder bugs.													
1731.	Engine oil temperature gages - indicate normal (below 175°C).													
1732.	Engine oil pressure - normal (at least 25 psi at 90% N2).													
1733.	Engine oil pressures - not increasing (evidence of malfunction). ------	14	06	40	15	07	00	01	00	20				
1734.	Request for engine data readings for the log - Second Officer. --------	14	06	39	14	07	00			21	3	2	2	
1735.	Captain response - auto throttles off?.						02			02	4	2	2	
1736.	Second Officer response - yes.						03			01	4	2	2	
1737.	Auto throttle switches - off (Capt).						06			03	3	2	2	
1738.	1-2 isolation valve - closed.						10			04	3	2	2	
1739.	#1 engine bleed switch - auto.						13			03	3	2	2	
1740.	#2 engine bleed switch - off.						16			03	3	2	2	
1741.	Pack indicator selector - pack 2.						19			03	3	2	2	
1742.	Pack 2 selector switch - manual cold, and hold.						33			14	3	2	2	
1743.	Pack 2 temperature valve indicator - approx. even with 1 & 3.						34			01	3	2	2	
1744.	Pack 2 selector switch - auto.						37			03	3	2	2	
1745.	#2 engine bleed switch - auto.						40			03	3	2	2	
1746.	#2 flow indicator - normal range.						43			03	3	2	2	
1747.	#2 pack off light - off.						45			02	3	2	2	
1748.	Log book - open (S.O.).					08	10			25	3	2	2	
1749.	Engine 1 N1 RPM - 94.9%.						16			06	3	2	2	
1750.	" 2 N1 RPM - 94.6%.						22			06	3	2	2	
1751.	" 3 N1 RPM - 94.3%.						28			06	3	2	2	
1752.	" 1 EGT - 683°C.						34			06	3	2	2	
1753.	" 2 EGT - 680°C.						40			06	3	2	2	
1754.	" 3 EGT - 676°C.						46			06	3	2	2	
1755.	" 1 N2 RPM - 89.4%.						52			06	3	2	2	
1756.	" 2 N2 RPM - 89.4%.						58			06	3	2	2	
1757.	" 3 N2 RPM - 89.1%.					09	04			06	3	2	2	
1758.	" 1 fuel flow - 4260#/hr.						10			06	3	2	2	
1759.	" 2 fuel flow - 4340#/hr.						16			06	3	2	2	
1760.	" 3 fuel flow - 4260#/hr.						22			06	3	2	2	
1761.	Total air temperature - -26°C.						27			05	3	2	2	
1762.	True air speed - 475 knots.						32			05	3	2	2	
1763.	Static air temperature - -56°C.						37			05	3	2	2	
1764.	Engine oil pressure #1 - 36 psi.						42			05	3	2	2	
1765.	" " " #2 - 39 psi.						47			05	3	2	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL			REMARKS
											CAP.	F.O.	S.O.	
1766.	Engine oil pressure #3 - 35 psi.	14	09	47	14	09	52			05	3	2	2	
1767.	Engine readings complete - Captain notified.						53			01	4	2	2	
1768.	Captain - acknowledges.						54			01	4	2	2	
1769.	Auto throttles - on.						55			01	4	2	2	
1770.	Request for coffee - Captain.						57			02	3	2	2	
1771.	Acknowledge request - Second Officer.						58			01	3	2	2	
1772.	Offer Coffee to First Officer - Second Officer.						59			01		2	2	
1773.	Hand set - pick up (S.O.).					10	01			02			2	
1774.	Forward attendant call switch - press.						03			02			2	
1775.	Forward attendant - responds.						08			05			2	
1776.	3 coffees - requested.						10			02			2	
1777.	#2 engine bleed air switch - off.						12			02			2	
1778.	Pack indicator selector - Pack 2.						14			02			2	
1779.	Pack 2 selector switch - hold in manual hot.						27			13			2	
1780.	Pack temperature valve position - full hot.						29			02			2	
1781.	Pack 2 selector switch - off.						31			02			2	
1782.	1-2 isolation valve switch - open.						33			02			2	
1783.	1-2 isolation valve disagree light - on then off.						36			03			2	
1784.	#1 engine bleed air switch - off.						38			02			2	
1785.	#2 engine bleed air switch - auto.						40			02			2	
1786.	Cockpit door signal - 2 raps (FFA).						45			05			2	
1787.	Coffee - delivered.					11	00			15			2	
1788.	Forward attendant - advised of possibility of turbulence ahead.						05			05			2	
1789.	Forward attendant - reminds crew to ask for wheel chairs.						10			05			2	
1790.	Course deviation bars - swing rt & lt (Hayes Center sta. passage).	14	09	58	14	10	00			02	4	2		
1791.	To/from indicators - from.						01			01	4	3		
1792.	RMI VOR pointers - move to tail.						04			03	4	3		
1793.	VOR course mode - engages.						06			02	4	3		
1794.	Auto pilot - maintains heading parallel to inbound track.						07			01	4	3		
1795.	FCS steer annun. - shows VOR CRS (VOR course).						08			01	4	3		
1796.	High altitude chart - consult for outbound track (053°).						28			20	4	3		
1797.	Course selectors - set to 053°.						33			05	4	3		
1798.	VOR tracking mode - re-engages.					12	06		01	33	4	3	2	
1799.	FCS steer annunciator - shows VOR TRK.						08			02	4	3	2	
1800.	Time over Hayes Center - 14:10.						10			02	4	3	2	
1801.	Compare time ofer with flight plan - Captain.						25			15	4	3	2	
1802.	Radio call - Denver Center.					19	55		07	30	3	3	2	
1803.	Radio call - acknowledge (F.O.).					20	00			05	3	3	2	
1804.	Request if airplane has INS or Omega Nav capability - Denver center.						05			05	3	3	2	
1805.	Response - airplane has INS.						10			05	3	3	2	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL			REMARKS
					CAP.	F.O.	S.O.	
1806.	Clearance direct from present position to Dubuque - Denver center. -----	14 20 10	14 20 15	15	4	3	2	
1807.	Clearance - acknowledged - First Officer.		20	05	3	3	2	
1808.	Clearance to Minneapolis center on 135.1 - Denver center.		25	05	4	3	2	
1809.	Clearance - acknowledged (F.O.).		30	05	3	3	2	
1810.	Radio/INS switches - INS.		33	03	4	3	2	
1811.	HSI MAG indication - changes to TRU.		34	01	4	3	2	
1812.	HSI RAD indication - changes to INS.		35	01	4	3	2	
1813.	HSI DME indication - changes to distance to next way point (Wolbach).		36	01	4	3	2	
1814.	NAV mode switch - press (Capt).		37	01	4	3	2	
1815.	FCS steer annunciator - shows INS TRK.		38	01	4	3	2	
1816.	Auto pilot - steers directly toward Wolbach.		39	01	3	3	2	
1817.	#1 INS data selector - dis/time.		40	01	4	2	2	
1818.	#1 INS display - shows distance and time to Wolbach.		41	01	3	2	2	
1819.	#2 INS data selector - xtk/tke.		43	02	3	3	2	
1820.	#2 INS display - shows cross track errors, if any.		45	02	3	2	2	
1821.	INS waypoint change switches 1 & 2 - press.		46	01	4	3	2	
1822.	INS way point change switches - light up.		47	01	4	3	2	
1823.	Insert switches - light up.		47	---				
1824.	INS 1 & 2 - key in 0 & 4 (0 is present position, 4 is Dubuque).		48	01	4	3	2	
1825.	INS 1 & 2 from/to window - show 0/4.		50	02	4	3	2	
1826.	Insert keys - press.		51	01	4	3	2	
1827.	Insert key lights - out.		52	01	3	2	2	
1828.	#1 INS display - shows distance and time to Dubuque.		54	02	3	2	2	
1829.	Auto pilot - turns airplane directly toward Dubuque.		56	02	3	2	2	
1830.	HSI & ADI indicate - turn toward Dubuque.		57	01	3	2	2	
1831.	VHF radio 1 - tuned to 135.1.	21	00	03	3	3	2	
1832.	Minneapolis contact - First Officer.		05	05	3	3	2	
1833.	Cruising flight level - 37.0.		08	03	3	3	2	
1834.	Contact acknowledged - Minneapolis center.		13	05	3	3	2	
1835.	Radar contact - direct Dubuque.		18	05	3	3	2	
1836.	VOR 1 & 2 - tune Wolbacj 114.8.		33	05	4	3	2	
1837.	VOR volume selector - increase.		36	03	4	3	2	
1838.	Wolbach identifier (OBH) - check aurally.		38	02	4	3	2	
1839.	RMI VOR pointers - swing passing abeam Wolbach.	25	00	03 22	3	3	2	
1840.	Time abeam - 14:25 (compare with flight plan).		12	12	4	3	2	
1841.	Fuel remaining request - Captain.		14	02	4	2	3	
1842.	Response - 39,000# (S.O., fuel gages).		19	05	4	2	3	
1843.	Flight plan fuel remaining - 38,400#.		24	05	4	2	3	
1844.	Fuel gage reading & flight plan - compare (Capt).		39	15	4	2	2	
1845.	Radio call - Minneapolis center.	29	00	03 21	3	2	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
1846.	Radio call acknowledged - First Officer.	14	29	00	14	29	05			05	3	3	2	
1847.	Clearance - to Minneapolis next sector on 135.35.						10			05	4	3	2	
1848.	Clearance - acknowledged (F.O.).						15			05	3	3	2	
1849.	VHF radio 1 - tuned to 134.35.						30			15	4	2	2	
1850.	Minneapolis center - contact (F.O.).						35			05	3	3	2	
1851.	Cruising flight level - 37.0, direct Dubuque.						38			03	3	3	2	
1852.	Contact acknowledged - Minneapolis center,						43			05	3	3	2	
1853.	have - radar contact.						48			05	3	3	2	
1854.	Cumulus clouds - visible ahead.						54			06	4	3	2	
1855.	Radar function switch - normal.						56			02	4	3	2	
1856.	Tilt control - adjust.						59			03	4	3	2	
1857.	Precipitation areas - displayed on scope.					30	01			02	4	3	2	
1858.	Cabin announcement - turbulent air ahead,						21			02	4	3	2	
1859.	Seat belts - fastened.						23			01	4	3	2	
1860.	Seat belt sign switch - on (Capt).						25			02	4	3	2	
1861.	Request First Officer to get clearance around weather - Captain.						27			02	4	3	2	
1862.	Estimated heading change 5 to 10° left.						29			02	3	3	2	
1863.	*Minneapolis center - contact (F.O.).*						34			05	3	3	2	
1864.	Contact acknowledged - Minneapolis center.						39			05	3	3	2	
1865.	Request course change 5 or 10° left for weather - First Officer.						44			05	3	3	2	
1866.	Cleared 10° left - Minneapolis center.						49			05	4	3	2	
1867.	Clearance - acknowledged (F.O.).						51			02	3	3	2	
1868.	Heading selector - set to 067°						54			03	4	2	2	
1869.	Heading selector - pull out (Capt).						55			01	4	2	2	
1870.	Auto pilot - turns left to 067°					31	00			05	3	2	2	
1871.	FGS steer annunciator - shows HDG SEL.						02			02	3	2	2	
1872.	Rough air - encountered.					32	00			58	3	2	2	
1873.	Turbulence mode selector - press (Capt).						01			01	4	2	2	
1874.	Auto pilot switch - moves to CWS.						01			--				
1875.	Auto throttle switches - drop to off.						01			--				
1876.	Stabilizer automatic trim - stops.						01			--				
1877.	Auto pilot red warning lights - flash.						01			--				
1878.	Auto throttle red warning lights - flash.						01			--				
1879.	Auto pilot red warning lights - press to shut off.						06			05	4	2	2	
1880.	Auto throttle red warning lights - press to shut off.						10			04	4	2	2	
1881.	Elevator response - damped.						11			01	4	2	2	
1882.	Auto pilot - maintains attitude and heading.	14	32	01	14	35	00		02	49	--	--	--	
1883.	Flight control - by CWS through auto pilot.			01			00		02	49	--	--	--	
1884.	FGS pitch annunciator - shows TURB.			01			00		02	49	--	--	--	
1885.	All other FGS annunciators - go blank.			01			00		02	49	--	--	--	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
1886.	Rough air - passed.	14	32	01	14	35	00		02	49	--	--	--	
1887.	Auto pilot #1 switch - command.						01			01	4	2	2	
1888.	Auto pilot - holds heading and altitude.						02			01	3	2	2	
1889.	FGS steer annunciator - shows HDG HOLD.						03			01	3	2	2	
1890.	FGS pitch annunciator - shows ALT HOLD.						04			01	3	2	2	
1891.	Auto throttle switches - on.						07			03	4	2	2	
1892.	Throttles - adjust to establish and hold selected 270 knots.						10			03	3	2	2	
1893.	Radio call - Minneapolis center.						13			03	3	3	2	
1894.	Radio call - acknowledged (F.O.).						18			05	3	3	2	
1895.	Clearance direct from present position to Dubuque - Minneapolis cntr.						23			05	4	3	2	
1896.	Clearance acknowledged - First Officer.						25			02	3	3	2	
1897.	Radio/INS switches - check in INS.						27			02	4	3	2	
1898.	NAV mode selector - press (Capt).						30			03	3	3	2	
1899.	FGS steer annunciator - shows INS CAP.						32			02	3	2	2	
1900	Way point change switches - press (Capt & F.O.).						35			03	4	3	2	
1901.	From/to window - check still 0 4.						38			03	4	3	2	
1902.	Insert keys - press.						41			03	4	3	2	
1903.	FGS steer annunciator - shows INS TRK.						46			05	4	3	2	
1904.	Auto pilot - steers directly to Dubuque.						51			05	3	2	2	
1905.	Cabin announcement - smooth air .						56			05	4	2	2	
1906.	Seat belt sign switch - off.						58			02	4	2	2	
1907.	Radio call - Minneapolis center.					36	00			02	3	3	2	
1908.	Radio call acknowledged - First Officer.						05			05	3	3	2	
1909.	Clearance to next sector on 133.77 - Minneapolis.						10			05	3	3	2	
1910.	Clearance acknowledged - First Officer.						15			05	3	3	2	
1911.	VHF radio 1 - tuned to 133.77.						30			15	3	3	2	
1912.	Minneapolis contact - First Officer.						35			05	3	3	2	
1913.	Cruising - flight level 37.0.						40			05	3	3	2	
1914.	Contact - acknowledged (Minneapolis).						45			05	3	3	2	
1915.	Speed - requested (Minneapolis).						50			05	3	3	2	
1916.	Response - 270 knots (F.O.).						55			05	3	3	2	
1917.	Clearance turn left to 030° for spacing - Minneapolis center.					37	00			05	4	3	2	
1918.	Clearance to 030° - acknowledged (F.O.).						05			05	3	3	2	
1919.	Request F.O. to ask for speed reduction rather than turn - Captain.						10			05	4	3	2	
1920.	Minneapolis contact - First Officer.						15			05	3	3	2	
1921.	Contact acknowledged - Minneapolis.						20			05	3	3	2	
1922.	Speed reduction - requested.						25			05	3	3	2	
1923.	Speed reduction to 259 knots approved - stay on course (Minneapolis).						30			05	4	3	2	
1924.	Auto throttle speed selector - set to 250 knots.						35			05	4	2	2	
1925.	Throttles - reduce to slow to and maintain 250 knots.						40			05	3	2	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
1926.	Enroute chart - consult for Dubuque VOR freq (Capt).	14	37	40	13	45	00		07	20	3	2	2	
1927.	VOR radios - tune to 115.8.						05			05	4	3	2	
1928.	VOR radios - monitor for proper identification.						10			05	4	3	2	
1929.	Chicago weather - requested by Captain.					47	17		02	07	3	2	3	
1930.	VHF radio 2 - tuned to 122.0 (S.O.).						27			10	3	2	3	
1931.	ACARS VOX mode - select (S.O.).						30			03	3	2	3	
1932.	Flight watch - contact (S.O.).						35			05	3	2	3	
1933.	Contact acknowledged - Flight watch.						40			05	3	2	3	
1934.	Chicago weather for 15:30 - requested.						45			05	3	2	3	
1935.	Response - stand by.						50			05	3	2	3	
1936.	Radio call - flight watch.					48	10			20	3	2	3	
1937.	Radio call - acknowledged (S.O.).						15			05	3	2	3	
1938.	15:30 Chicago weather - 2,300' overcast,						20			05	3	2	3	
1939.	- visibility 8 miles,						23			03	3	2	3	
1940.	- temperature 76°,						26			03	3	2	3	
1941.	- wind 150°/15 knots, gusts to 22 knots.						29			03	3	2	3	
1942.	Chicago weather - acknowledged (S.O.).						34			05	3	2	3	
1943.	Chicago weather - passed to Captain.						39			05	4	2	3	
1944.	ACARS data mode selected - Second Officer.						44			05	3	2	3	
1945.	Radio call - Minneapolis center.					51	50		03	06	3	2	2	
1946.	Radio call - acknowledged (F.O.).						55			05	3	3	2	
1947.	Clearance to chicago center on 133.82 - Minneapolis center.					52	00			05	4	3	2	
1948.	Clearance - acknowledged (F.O.).						05			05	3	3	2	
1949.	VHF radio 1 - tuned to 133.82.						20			15	3	3	2	
1950.	Chicago - contact (F.O.).						25			05	3	3	2	
1951.	Cruising - flight level 37.0.						30			05	3	3	2	
1952.	Contact - acknowledged (Chicago center).						35			05	3	3	2	
1953.	Request Ident - Chicago.						40			05	3	3	2	
1954.	Transponder ident button - press.						45			05	3	3	2	
1955.	Response to ident & request speed - Chicago.						50			05	3	3	2	
1956.	Speed 250 knots - First Officer.						55			05	3	3	2	
1957.	Clearance to resume cruise speed & clear of traffic - Chicago					53	00			05	4	3	2	
1958.	Clearance & traffic info - acknowledged (F.O.).						05			05	3	3	2	
1959.	Speed selector - set to 270.						10			05	4	3	2	
1960.	Auto throttles - advance to accelerate to and hold 270knots.						15			05	3	2	3	
1961.	POM (flight ops. manual) - consult for ATIS freq (S.O.).				15	00	15		07	00	3	2	2	
1962.	VHF radio 2 - tune to 135.15 (S.O.).						30			15	3	2	3	
1963.	VHF radio - monitor to copy terminal information.						32			02	3	2	3	
1964.	Information - golf,						34			02	3	2	3	
1965.	ceiling - measured 2,300' broken, 8,000' broken,						36			02	3	2	3	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
1966.	visibility - 8 miles,	15 00 36	15 00 38	02	3	2	3	
1967.	wind - 150°/15 knots, gusts to 22,		40	02	3	2	3	
1968.	temperature - 72°/dew point 66°,		42	02	3	2	3	
1969.	altimeter - 29.54.		46	04	3	2	3	
1970.	Landing runway - 14 right, departures 14 left.		48	02	3	2	3	
1971.	Request for landing data - Captain/S.O.		50	02	4	2	3	
1972.	Landing gross weight - 315,000# (current wt less est. burn).		01 05	15	3	2	3	
1973.	Structural landing weight limit - 347,800# (compare with land. wt.).		20	15	3	2	3	
1974.	Performance limit - 400,000# (gross wt charts; " " " "		35	15	3	2	3	
1975.	Runway limit - 380,000# " " " " " "		50	15	3	2	3	
1976.	Reference speed - 128 knots (from landing card).		55	05	3	2	3	
1977.	Clean maneuvering speed - 198 knots (ref + 70).		02 00	05	3	2	3	
1978.	Slat extend maneuvering speed - 173 knots (ref + 45).		05	05	3	2	3	
1979.	15 flap maneuvering speed - 163 knots (ref + 35).		10	05	3	2	3	
1980.	22 flap " " - 153 knots (ref + 25).		15	05	3	2	3	
1981.	35 flap approach speed - 138 knots (ref + 10).		20	05	3	2	3	
1982.	50 flap " " - 133 knots (ref + 05).		25	05	3	2	3	
1983.	35 flap threshold speed - 133 knots (ref + 05).		30	05	3	2	3	
1984.	50 flap threshold speed - 128 knots (ref.).		35	05	3	2	3	
1985.	Landing card - inscribe and pass to Captain.		40	05	4	2	3	
1986.	Airspeed reminder bugs - set 173, 153, 133, (Capt &F.O.).		03 00	20	4	3	2	
1987.	INS alert light - flashing.		05	05	4	3	2	
1988.	Time to Dubuque - 2 minutes.		05	--				
1989.	Radio/INS switches - radio.		07	02	4	3	2	
1990.	HSI TRU indication - changes to MAG.		08	01	3	2	2	
1991.	HSI INS indication - changes to RAD.		09	01	3	2	2	
1992.	HSI distance to way point - changes to DME readout.		10	01	3	2	2	
1993.	NAV mode switch - press (Capt).		13	03	3	3	2	
1994.	FGS steer annunciator - shows VOR TRK.		15	02	3	2	2	
1995.	Course deviation bars - swing rt & lt (DBQ station passage).		05 00	01 45	3	2	2	
1996.	To/from indicator - from.		01	01	4	3	2	
1997.	RMI VOR pointers - move to tail.		04	03	4	3	2	
1998.	VOR course mode - engages.		06	02	4	3	2	
1999.	FGS steer annunciator - shows VOR CRS.		07	01	3	2	2	
2000.	Enroute chart - consult for out bound course (094°).		27	20	4	2	2	
2001.	Course selectors - set to 094 (Capt & F.O.).		32	05	4	3	2	
2002.	Auto pilot - turns airplane to parallel 094° (course mode).		35	03	3	2	2	
2003.	Time over Dubuque - noted (15:05).		37	02	4	3	2	
2004.	Compare time over DBQ with flight plan - Captain.		41	04	4	2	2	
2005.	Radio call - Chicago.		06 20	39	3	3	2	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2006.	Radio call - acknowledge (F.O.).	15 06 20	06 25	05	3	3	2	
2007.	Clearance to descend to flt level 31.0 - Chicago center.		30	05	4	3	2	
2008.	Clearance - acknowledged (F.O.).		32	02	3	3	2	
2009.	Request 31,000' set and armed - Captain.		33	01	4	3	2	
2010.	Altitude selector - set to 31,000' (F.O.).		36	03	3	3	2	
2011.	Altituce selector - pull out.		39	03	3	3	2	
2012.	FGS arm annunciator - shows ALT.		42	03	3	3	2	
2013.	Auto throttle disconnect buttons - press (Capt).		44	02	4	2	2	
2014.	Auto throttle warning lights - flashing.		45	01	4	2	2	
2015.	Auto throttle disconnect buttons - press again.		47	02	4	2	2	
2016.	Auto throttle warning lights - off.		48	01	4	2	2	
2017.	Mach hold selector - press (Capt).		51	03	4	2	2	
2018.	Mach hold mode - engages.		53	02	3	2	2	
2019.	FGS pitch annunciator - shows MACH HOLD.		54	01	3	2	2	
2020.	Auto pilot - maintains .83 mach with pitch.		55	01	3	2	2	
2021.	Throttles - close (Capt).		07 00	05	4	2	2	DESCENT
2022.	Auto pilot - lowers nose to mbintain speed.		04	04	3	2	2	PROCEDURES
2023.	Vertical speed indicators and altimeters - show descent.		05	01	4	3	2	
2024.	VOR tracking mode - engages (end of course mode test).		07	02	4	3	2	
2025.	FGS steer annunciator - shows VOR TRK.		09	02	3	2	2	
2026.	Fuel temperature indicator - -26°C.		10	01	--	--	3	
2027.	Fuel temperature - enter in log (S.O.).		25	15	--	--	3	
2028.	Approach plate - consult for Chicago field elev. (S.O.).		40	15	--	--	3	
2029.	Cabin altitude set scale - check set at 667'.		50	10	3	2	3	
2030.	Cabin altimeter baro knob - set 29.54 (ATIS).		52	02	3	2	3	
2031.	Request Second Officer to make cabin announcement - Captain.		53	01	4	2	3	
2032.	Hand set - pick up (S.O.).		58	05	3	2	3	
2033.	PA switch - press.		08 00	02	3	2	3	
2034.	Cabin announcement - starting descent,		03	03	3	2	3	
2035.	- may extend speed brakes causing some vibrations.		05	02	3	2	3	
2036.	Altitude - 36,000' descending.		05	--				
2037.	Cabin vertical speed - indicates descent.		07	02			3	
2038.	#1 left engine driven hyd pump switch -- off.		08	01			3	
2039.	#1 left pump pressure low light - on.		10	02			3	
2040.	#1 hydraulic pressure - min. 2800#.		11	01			3	
2041.	#1 left pump switch - on.		12	01			3	
2042.	#1 pressure low light - off.		12	--				
2043.	#1 right engine driven hyd pump switch - off.		13	01			3	
2044.	#1 right pump pressure low light - on.		14	01			3	
2045.	#1 hydraulic pressure - min.2800#.		15	01			3	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
2046.	#1 right pump - auto.	15	08	15	15	08	16			01			3	
2047.	#1 right pressure low light - off.						16			--				
2048.	#2 left engine driven hyd pump switch - off.						17			01			3	
2049.	#2 left pump pressure low light - on.						19			02			3	
2050.	#2 hydraulic pressure - min. 2800#.						20			01			3	
2051.	#2 left pump - On.						21			01			3	
2052.	#2 left press low light - off.						21			--				
2053.	#2 right engine driven hyd pump switch - off.						22			01			3	
2054.	#2 right pump pressure low light - on.						23			01			3	
2055.	#2 hydraulic pressure - min. 2800#.						24			01			3	
2056.	#2 right pump - auto.						25			01			3	
2057.	#2 right pressure low light - off.						25			--				
2058.	#3 left engine driven hyd pump switch - off.						26			01			3	
2059.	#3 left pump pressure low light - on.						28			02			3	
2060.	#3 hydraulic pressure - min. 2800#.						29			01			3	
2061.	#3 left pump - on.						30			01			3	
2062.	#3 right engine driven hyd pump switch - off.						31			01			3	
2063.	#3 right pump pressure low light - on.						32			01			3	
2064.	#3 hydraulic pressure - min. 2800#.						33			01			3	
2065.	#3 right pump - auto.						34			01			3	
2066.	#3 right pressure low light - off.						34			--				
2067.	Hydraulic temperature - normal.						35			00.			3	
2068.	Hydraulic quantity - normal.						35			00.			3	
2069.	Motor pumps - check in arm.						36			01			3	
2070.	CSD oil press low lights - off.						37			00.			3	
2071.	CSD outlet temperature - below the yellow band.						37			00.			3	
2072.	CSD push for rise button - press.						38			01			3	
2073.	CSD rise temperature - below the yellow band.						39			01			3	
2074.	Generator fail lights - off.						40			01			3	
2075.	Generator off lights - off.						41			01			3	
2076.	AC loads - normal.						42			01			3	
2077.	Left and right emergency bus off lights - Off.						43			00.			3	
2078.	Dual land selected and power on lights - off.						43			00.			3	
2079.	AC bus 1, 2 & 3 bus off lights - off.						44			00.			3	
2080.	AC bus tie isolate lights - off.						44			00.			3	
2081.	Emergency power in use light - off.						45			01			3	
2082.	DC loads - normal.						46			01			3	
2083.	Left and right DC emergency bus off lights - off.						47			00.			3	
2084.	DC bus 1, 2 & 3 off lights - off.						47			00.			3	
2085.	DC tie switches - open.						48			01			3	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL			REMARKS
					CAP.	F.O.	S.O.	
2086.	DC 1 & 3 tie closed lights - off.	15 08 48	15 08 48	--				
2087.	DC x-tie open light - off.		49	01			3	
2088.	Battery switch - on/locked.		50	00.5			3	
2089.	Battery bus off light - off.		50	00.5			3	
2090.	APU - shut down, lights off.		51	01			3	
2091.	Volt/amp/freq selector - battery and left emergency bus.		52	00.5			3	
2092.	AC volts - 115.		52	00.5			3	
2093.	AC freq - 400 hz.		53	00.5			3	
2094.	Battery volts - green band.		53	00.5			3	
2095.	Galley bus switches - on.		54	00.5			3	
2096.	Galley power off lights - off.		54	00.5			3	
2097.	Coffee bar switch - on.		55	00.5			3	
2098.	Coffee bar power off light - off.		55	00.5			3	
2099.	Galley over heat light - off.		56	01			3	
2100.	Fuel schedule lights - off.		57	01			3	
2101.	Fill valve open lights - off.		58	01			3	
2102.	Fuel quantity gages - approx. even.		59	00.5			3	
2103.	Tank pump pressure low lights off.		59	00.5			3	
2104.	Fuel temperature - above -36°C.		09 00	01			3	
2105.	Fuel x-feed switches - closed.		01	01			3	
2106.	X-feed disagree lights - off.		02	01			3	
2107.	Fuel pressure indicators - normal.		03	01			3	
2108.	Fuel used indicators - show normal usage.		04	01			3	
2109.	Fuel dump valves - closed.		05	01			3	
2110.	#2 & 3 engine bleed selectors - auto.	15 09 45	15 09 46	01			3	Break for approach briefing.
2111.	#1 engine bleed switch - off.		47	01			3	
2112.	#1, 2 & 3 manifold fail lights - off.		48	01			3	
2113.	#1, 2 & 3 temperature high lights - off.		49	01			3	
2114.	#1 high stage open light - off.		50	01			3	
2115.	#2 &3 high stage open lights - on (at low throttle settings).		51	01			3	
2116.	#1 pneumatic temperature indicator - low.		52	01			3	
2117.	#2 & 3 temperature indicators - normal.		53	01			3	
2118.	APU isolation valve - closed.		54	01			3	
2119.	#1, 2 & 3 pressure indicators - normal.		55	01			3	
2120.	1-2 isolation valve switch - open.		56	00.5			3	
2121.	1-2 isolation valve disagree light - off.		56	00.5			3	
2122.	1-3 isolation valve switch - normal.		57	00.5			3	
2123.	1-3 isolation valve disagree light.		57	00.5			3	
2124.	Wing anti ice switch - off.		58	00.5			3	
2125.	Wing anti ice disagree light - off.		58	00.5			3	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
2126.	#1 & 3 flow meters - normal range.	15	09	58	15	09	59			00.5			3	
2127.	#2 flow meter - low.						59			00.5			3	
2128.	#1 & 3 pack switches - auto.					10	00			01			3	
2129.	#2 [illegible] - off.						01			01			3	
2130.	[illegible] selector - pack 1.						02			01			3	
2131.	[illegible] temp - normal.						03			01			3	
2132.	[illegible] valve position ind. - normal range.						04			00.5			3	
2133.	[illegible] temperature - normal.						04			00.5			3	
2134.	[illegible] selector - pack 2.						05			01			3	
2135.	Turbine inlet temperature - cold.						06			01			3	
2136.	Pack temperature valve position ind - full hot.						07			00.5			3	
2137.	pack discharge temperature - cold.						07			00.5			3	
2138.	Pack indicator selector - pack 3.						08			01			3	
2139.	Turbine inlet temperature - normal.						09			01			3	
2140.	Pack temperature valve position ind. - normal range.						10			00.5			3	
2141.	Pack discharge temperature - normal.						10			00.5			3	
2142.	Pack off lights - off.						11			01			3	
2143.	Air conditioning duct temperatures - normal.						12			01			3	
2144.	Cockpit, galley and cabin compartment temps - comfort range.						13			01			3	
2145.	Trim air switch - on.						14			00.5			3	
2146.	Duct/avionic compartment overheat light - off.						14			00.5			3	
2147.	Cargo fire warning lights - off.						15			01			3	
2148.	Smoke & heat detector lights - off.						16			00.5			3	
2149.	Cargo compartment agent low lights - off.						16			00.5			3	
2150.	Cargo compartment temps - normal.						17			01			3	
2151.	Oxygen quantity gage - 1650 psi.						18			00.5			3	
2152.	Oxygen line pressure - white band.						18			00.5			3	
2153.	Cabin altitude rate - indicates descent.						19			01			3	
2154.	Cabin altitude - decreasing.						20			01			3	
2155.	Cabin altitude warning light - off.						21			01			3	
2156.	Cabin differential pressure - in white band.						22			01			3	
2157.	Cabin pressure relief open light - off.						23			01			3	
2158.	Annunciator panel lights - off.						24			01			3	
2159.	Engine fire detector loop lights - off.						25			01			3	
2160.	Engine oil quantity reminder bugs - indicate no loss of oil.						26			01			3	
2261.	Engine oil temperature - normal.						27			01			3	
2162.	Engine oil pressure - normal.						29			02			3	
2163.	Enroute chart - consult for Rockford VOR freq. (Capt).	15	07	09	15	07	25			16	4	2		
2164.	VOR radios - tune to 110.8.						30			05	4	3		
2165.	VOR radios - monitor for Rockford ident.						33			03	4	3		

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2166.	Course selectors - set to 098° (inbound to RFD).	15	07	33	15	07	35			02	4	3		
2167.	VOR course mode - engages (with freq change).						36			01	4	2		
2168.	Auto pilot - steers to parallel selected course.						38			02	3	2		
2169.	FGS steer annunciator - shows VOR CRS.						39			01	3	2		
2170.	Chicago approach plate (21-2) consult (Capt, F.O. & S.O.)					09	05		01	26	4	3	2	
2171.	Crew briefing - Captain conducts.						20			15	4	3	3	
2172.	Approach plate 21-2 - dated December 1981 (all confirm).						23			03	4	3	3	
2173.	Identification of ILS - OBD.						26			03	4	3	3	
2174.	Inbound ILS heading - 140°.						29			03	4	3	3	
2175.	VOR track mode - engages.						30			01	3	2	2	
2176.	FGS steer annunciator - shows VOR TRK.						31			01	3	2	2	
2177.	ROAMY DME mileage - 6.2 (continuing briefing).						32			01	4	3	3	
2178.	Glide slope height at ROAMY 2385'.						33			01	4	3	3	
2179.	Minimums - 1800' RVR, or						34			01	4	3	3	
2180.	- 1/2 mile,						35			01	4	3	3	
2181.	decision height - 86'.						36			01	4	3	3	
2182.	Missed approach - climb to 1200' straight ahead, then						37			01	4	3	3	
2183.	climbing right turn to 4,000',						38			01	4	3	3	
2184.	tracking the DuPage 085° radial to DuPage.						39			01	4	3	3	
2185.	DuPage VOR freq - 108.4.						40			01	4	3	3	
2186.	Holding pattern - left tear drop entry.						41			01	4	3	3	
2187.	Holding - inbound on 240° radial, right turns.						42			01	4	3	3	
2188.	ADF 2 - tune to ROAMY.						43			01	3	3	2	
2189.	ADF 2 - monitor for ident (OR).						44			01	3	3	2	
2190.	Altitude calls - S.O. will call 50', 30' & 10'.						45			01	4	3	3	
2191.	Altitude - descending through 35,500' approx.						46			01	3	2		
2192.	Air speed - has increased to 280 knots (normal descent speed).						47			01	3	2		
2193.	IAS mode selector switch - press.						48			01	4	2		
2194.	Auto pilot - holds 280 knots, mach decreases.						49			01	3	2		
2195.	Radio call - Chicago center.						52			03	3	3		
2196.	Radio call - acknowledged (F.O.).						56			04	3	3		
2197.	Clearance to next sector of Chicago on 138.05 - Chicago center.					10	00			04	4	3		
2198.	VHF radio 1 - tuned to 138.05.						05			05	3	3		
2199.	Chicago - contact (F.O.).						10			05	3	3		
2200.	Descending through 32,000' for 31,000' - First Officer.						15			05	3	3		
2201.	Contact acknowledged - Chicago.						20			05	3	3		
2202.	Radar contact - descend now to 14,000' (Chicago),						22			02	4	3		
2203.	- cross Rockford at 14,000'.						24			02	4	3		
2204.	Clearance acknowledged - First Officer.						29			05	4	2		
2205.	Altitude selector - set to 14,000'.						32			03	4	2	2	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2206.	Altitude selector - pull out.	15 10 32	15 10 33	01	4	3	2	
2207.	Captain - reminded 5 minutes to Rockford,		35	02	4	3	2	
2208.	- 17,000' to lose (F.O.).		36	01	4	2	2	
2209.	Speed brake handle - set to 2/3 (Capt).		37	01	3	2	2	
2210.	Descent rate - increased.		38	01	3	2	2	
2211.	ACARS VOX mode - selected (S.O.).		41	03	3	2	3	
2212.	Flt Ops manual - consulted for gate frequency (S.O.).		56	15	3	2	3	
2213.	VHF radio 2 - tuned to 129.3.		11 01	05	3	2	3	
2214.	Chicago ramp - contact (S.O.).		06	05	3	2	3	
2215.	Contact acknowledged - Chicago ramp.		11	05	3	2	3	
2216.	Requesting - connection info,		13	02	3	2	3	
2217.	- gate assignment and		14	01	3	2	3	
2218.	- two wheel chairs.		15	01	3	2	3	
2219.	Acknowledge requests - Chicago ramp,		20	05	3	2	3	
2220.	Gate assignment - E 11 W (E concourse, gate 11 Wide body).		22	02	3	2	2	
2221.	- stand by for connection info.		24	02	3	2	3	
2222.	Altitude - 18,000' descending.		14 30	03 06	3	2	2	
2223.	Runway turnoff lights - on (Capt).		33	03	4	2	2	
2224.	Altimeters - set 29.54 (Capt & F.O.).		38	05	4	3	2	
2225.	Speed brake handle - retracted (Capt).		40	02	4	2	2	
2226.	Descent rate - reduced.		43	03	3	2	2	
2227.	Radio call - Chicago ramp with connection info.		48	05	3	2	3	
2228.	Radio call - acknowledged (S.O.).		50	02	3	2	3	
2229.	Boston - gate E6.		54	04	3	2	3	
2230.	Cleveland - gate E4.		56	02	3	2	3	
2231.	Detroit - gate F5.		58	02	3	2	3	
2232.	New york - gate E9.		15 00	02	3	2	3	
2233.	Miami - gate E3A.		02	02	3	2	3	
2234.	Newark - gate F6.		04	02	3	2	3	
2235.	Philadelphia - gate F7.		06	02	3	2	3	
2236.	Gate connections - acknowledged (S.O.).		10	04	3	2	3	
2237.	Hand set - pick up (S.O.).		11	01	3	2	3	
2238.	Forward attendant call switch - press.		13	02	3	2	3	
2239.	Call - acknowledged (FFA).		18	05	3	2	3	
2240.	Gate connection info - available.		20	02	3	2	3	
2241.	Cockpit access signal - 2 taps (FFA).		52	32	3	2	3	
2242.	Gate connection info - passed to First Flight Attendant.		55	03	3	2	3	
2243.	Sevice in cabin complete, cabin secure - FFA to crew.		59	04	4	2	3	
2244.	ACARS data mode - select.		16 02	03	3	2	3	
2245.	Altitude - 14,750' descending.		05	03	3	2	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
2246.	Altitude alert light - on.	15	16	05	15	18	06			06	3	2	2	
2247.	Altitude - 14,250' descending.						35			29	3	2	2	
2248.	Altitude alert light - off.						36			01	3	2	2	
2249.	Altitude capture mode - engage.						40			04	3	2	2	
2250.	FGS pitch annunciator - shows ALT CAP.						41			01	3	2	2	
2251.	FGS arm annunciator - shows ALT HOLD.						42			01	3	2	2	
2252.	Auto pilot - levels airplane at 14,000'.						50			08	3	2	2	
2253.	FGS pitch annunciator - shows ALT HOLD.						51			01	3	2	2	
2254.	Speed selector - set to 280 knots (Capt).						53			02	4	2	2	
2255.	Auto throttle switches - on.						55			02	4	2	2	
2256.	Throttles - adjust to hold 280 knots.						58			03	3	2	2	
2257.	FGS auto throttle annunciator - shows SPD.					17	00			02	4	3	2	
2258.	Course deviation bars - swing rt & lt (RFD station passage).						30			30	4	3	2	
2259.	To/from indicators - from.						31			01	4	3	2	
2260.	RMI VOR pointers - move to tail.						34			03	4	3	2	
2261.	VOR course mode - engages.						36			02	4	3	2	
2262.	FGS steer annunciator - shows VOR CRS.						37			01	4	3	2	
2263.	Auto pilot - steers to parallel selected course.						40			03	3	2	2	
2264.	Course selectors - set to 102° (outbound course).						42			02	3	2	2	
2265.	Radio call - Chicago.						45			03	3	3	2	
2266.	Radio call - acknowledge (F.O.).						50			05	3	3	2	
2267.	Clearance to descend to 8,000' &						52			02	4	3	2	
2268.	radar vectors ; turn left to 080°.						55			03	4	3	2	
2269.	Clearance - acknowledged (F.O.).						57			02	3	3	2	
2270.	VOR track mode - re-engages.						58			01	3	2	2	
2271.	FGS steer annunciator - shows VOR TRK						59			01	3	2	2	
2272.	Auto pilot - tracks out bound radial.					18	00			01	3	2	2	
2273.	Auto throttles switches - off.(Capt).						02			02	4	2	2	
2274.	IAS mode - select.						04			02	4	2	2	
2275.	Throttles - closed.						06			02	4	2	2	
2276.	FGS auto throttle annunciator - goes blank.						07			01	4	2	2	
2277.	Altitude selector - set to 8,000' & pull out. (F.O.).						12			05	3	3	2	
2278.	Cabin altimeter - level at approx. 400' (below fld elev. for pos. press).						14			02	3	2	2	
2279.	FGS pitch annunciator - shows IAS HOLD.						16			02	3	2	2	
2280.	Heading selector - set to 080° (Capt).						19			03	4	2	2	
2281.	Heading selector - pull out.						21			03	4	2	2	
2282.	Heading select mode - engages.						23			02	3	2	2	
2283.	Auto pilot - turns airplane left to 080°.						26			03	3	2	2	
2284.	FGS steer annunciator - shows HDG SEL.						27			01	3	2	2	
2285.	Altitude - 12,000' descending.					19	00			33	3	2	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL			REMARKS
											CAP.	F.O.	S.O.	
2286.	Vertical speed selector - 1,000 fpm down (Capt).	15	19	00	15	19	05			05	4	2	2	
2287.	Vertical speed - reduces to 1,000 fpm down						07			02	4	2	2	
2288.	Airspeed - decreases.					20	50		01	45	--	--	--	
2289.	FCS pitch annunciator - shows VERT SPD.	15	19	07	15	19	08			01	3	2	2	
2290.	Altitude - 10,000 fpm descending.					20	59		01	51	3	2	2	
2291.	Airspeed - 250 knots.					21	00			01	3	2	2	
2292.	IAS hold mode selector - press.						02			02	4	2	2	
2293.	Auto throttles - advance to hold 250 knots.						04			02	3	2	2	
2294.	Airspeed selector - set to 250 knots.						05			01	4	2	2	
2295.	FCS pitch annunciator - shows - IAS HOLD.						06			01	3	2	2	
2296.	Descent checklist requested - Cptain.						08			02	4	2	3	
2297.	Request - acknowledged (S.O.).						10			02	4	2	3	
2298.	Hydraulics - checked, motor pumps & rudder standby power armed.						15			05	3	2	3	
2299.	Electrical - checked.						20			05	3	2	3	
2300.	Fuel - checked, all aft pumps on.						25			05	3	2	3	
2301.	Pneumatics & air conditioning - checked.						30			05	3	2	3	
2302.	Pressurization - set.						35			05	3	2	3	
2303.	Airspeed bugs - set.						38			03	3	2	3	
2304.	Altimeters - set.						41			03	3	2	3	
2305.	Thrust computer - GA not set.						43			02	3	2	3	
2306.	Radio/IRS switches - radio.						46			03	3	2	3	
2307.	Seat power switches - off.						49			03	3	2	3	
2308.	Seat belt sign - not on.						50			01	3	2	3	
2309.	No smoking sign - not on.						51			01	3	2	3	
2310.	Captain - notify check list complete except,						53			02	4	2	3	
2311.	Thrust computer - not in GA,						54			01	4	2	3	
2312.	Seat belt & no smoking signs - not on.						55			01	4	2	3	
2313.	Request signs on & cabin announcement (Capt).					22	00			05	4	2	3	
2314.	Seat belt sign switch - on (S.O.).						02			02	3	2	3	
2315.	No smoking sign switch - on.						04			02	3	2	3	
2316.	Hand set - pick up (S.O.).						09			05	3	2	3	
2317.	PA switch - press.						11			02	3	2	3	
2318.	Cabin announcement - seat belt signs on,						13			02	3	2	3	
2319.	Landing approach - will start soon.						15			02	3	2	3	
2320.	Thrust computer go around button - press (F.O.).						17			02	3	3	2	
2321.	Wl limit bugs - reposition to computer setting.						18			01	3	3	2	
2322.	Approach descent checklist complete - announcement (S.O.).						20			02	4	2	3	
2323.	Altitude - 8750' descending.						21			01	3	2	2	
2324.	Altitude alert light - on.						23			02	3	2	2	
2325.	Altitude - 8250' descending.						48			25	3	2	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
2326.	Altitude alert light - off.	15	22	48	15	22	50			02	4	2	2	
2327.	Altitude capture mode - engages.						55			05	4	2	2	
2328.	FGS pitch annunciator - shows ALT CAP.						56			01	4	2	2	
2329.	FGS arm annunciator - goes blank.						57			01	3	2	2	
2330.	Auto throttles - engage (Capt).						58			01	4	2	2	
2331.	Auto pilot - levels airplane at 8,000'.					23	00			02	4	2	2	
2332.	Altitude hold mode - engages.						01			01	3	2	2	
2333.	FGS pitch annunciator - shows ALT HOLD.						02			01	3	2	2	
2334.	Auto throttles - adjust to maintain 250 knots.						05			03	3	2	2	
2335.	Radio call - Chicago.						10			05	3	3	2	
2336.	Radio call acknowledged - First Officer.						12			02	3	3	2	
2337.	Clearance to contact Chicago Approach Control - Chicago center.						17			05	4	3	2	
2338.	Clearance acknowledged - First Officer.						19			02	3	3	2	
2339.	VHF radio 1 tune to 119.8.						24			05	3	3	2	
2340.	Chicago approach control - contact - First Officer.						29			05	3	3	2	
2341.	Altitude - 8,000', &						31			02	3	3	2	
2342.	Heading - 080°.						33			02	3	3	2	
2343.	Contact acknowledged - Chicago approach control.						35			02	3	3	2	
2344.	Clearance to descend to 7,000' - Chicago approach.						37			02	4	3	2	
2345.	Clearance acknowledged - First Officer.						39			02	3	3	2	
2346.	Altitude selector - set to 7,000'.						42			03	4	2	2	
2347.	Altitude selector - pull out.						44			02	4	2	2	
2348.	FGS arm annunciator - shows ALT.						45			01	3	2	2	
2349.	Vertical speed selector - set to 1,000 fpm down.						47			02	4	2	2	
2350.	Auto pilot - descends the airplane.						48			01	3	2	2	
2351.	FGS pitch annunciator - shows VERT SPD.						49			01	3	2	2	
2352.	Auto throttles - adjust to maintain speed in descent.						52			03	3	2	2	
2353.	Altitude - 7,750' descending.					25	03		01	11	3	2	2	
2354.	Altitude alert light - on.						04			01	4	3	2	
2355.	Altitude 7,250' descending.						32			28	3	2	2	
2356.	Altitude alert light - off.						33			01	4	3	2	
2357.	Altitude capture mode - engages.						41			08	3	2	2	
2358.	FGS pitch annunciator - shows ALT CAP.						43			02	3	2	2	
2359.	FGS arm annunciator - goes blank.						45			02	3	2	2	
2360.	Auto pilot - levels airplane at 7,000'.						48			03	3	2	2	
2361.	Altitude hold mode - engages.						49			01	3	2	2	
2362.	FGS pitch annunciator - shows ALT HOLD.						50			01	3	2	2	
2363.	Auto throttles - adjust to maintain 250 knots.						53			03	3	2	2	
2364.	Radio call - Chicago approach.					27	23		01	30	3	3	2	
2365.	Radio call acknowledged - First Officer.						25			02	3	3	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
2366.	Clearance to reduce to 180 knots - Chicago approach.	15	27	25	15	27	30			05	4	3	2	
2367.	Speed reduction - acknowledged (F.O.).						32			02	3	3	2	
2368.	Captain requests - speed selector set to 180 &						34			02	4	3	2	
2369.	- slats extended.						36			02	4	3	2	
2370.	Speed selector - set to 180 (F.O.).						38			02	3	3	2	
2371.	Throttles - adjust to slow to 180 knots.						41			03	3	2	2	
2372.	Flap/slat handle - moved to zero/extend.						44			03	3	3	2	
2373.	Slat disagree light - on.						47			03	3	3	2	
2374.	Slat take off light - on & disagree light off.						49			02	3	2	2	
2375.	Landing gear warning lights (red) - on.						50			01	3	2	2	
2376.	Airspeed - reducing below 215 knots.					28	00			10	3	2	2	
2377.	Landing gear warning horn - sounding.						05			05	3	2	3	
2378.	Gear horn off button - press (S.O.).						09			04	3	2	3	
2379.	Gear warning horn - silenced.						10			01	3	2	2	
2380.	First Officer - asks if Captain wants gear down.						15			05	4	3	2	
2381.	Response - not yet (gear down uses 100# fuel per hour).						20			05	4	3	2	
2382.	Radio call - Chicago approach.					29	00			40	3	3	2	
2383.	Radio call acknowledged - First Officer.						05			05	3	3	2	
2384.	Radar vector - turn left to 140°.						10			05	4	3	2	
2385.	Heading change acknowledged - First Officer.						15			05	3	3	2	
2386.	Heading selector - set to 140°.						20			05	4	2	2	
2387.	Auto pilot - turns airplane to 140°.						40			20	3	2	2	
	FINAL APPROACH AND LANDING													
2388.	Radar vector - left turn to 190° (approach).	15	29	40	15	31	00		01	20	4	3	2	
2389.	Heading change acknowledged - First Officer.						02			02	3	3	2	
2390.	Heading selector - set to 190°.						07			05	4	2	2	
2391.	Auto pilot - turns airplane to 190°.	15	31	07	15	31	23			16	--	--	--	
2392.	VOR 1 radio - tuned to 109.7 14R ILS (Capt).	15	31	07	15	31	11			04	4	2	2	
2393.	VOR 1 monitored for ident (ORD) - Captain.						15			04	4	2	2	
2394.	Course selector 1 - set to 140° (ILS front course),						18			03	4	2	2	
2395.	Captain - asks F.O. to tune VOR 2 to ORD for DME info.						20			02	4	3	2	
2396.	Approach plate - consult for ORD freq (F.O.).						30			10	3	3	2	
2397.	VOR 2 - tuned to 113.9.						34			04	3	3	2	
2398.	VOR 2 - monitored for ident (ORD).						38			04	3	3	2	
2399.	Engine ignition switch - set to continuous B (S.O.).						41			03	3	2	3	
2400.	Flaps 15, speed 163 - requested by Captain.						43			02	4	3	2	
2401.	Speed brake handle - checked in retract position (F.O.).						46			03	3	3	2	
2402.	Flap/slat handle - moved to position 15.						49			03	3	3	2	
2403.	Flap handle position pointers - move to positon 15.						53			04	3	3	3	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
2404.	Flap position indicator tapes - move to position 15.	15	31	53	15	31	54			01	3	3	3	
2405.	Speed selector - set to 163 knots.						57			03	3	3	2	
2406.	Auto throttles - adjust to slow to 163 knots.					32	00			03	3	3	2	
2407.	Radar vector & descent clearance - rt to 250° descend to 5,000'. (ORD).						05			05	4	3	2	
2408.	Heading selector - set to 250°.						07			02	4	2	2	
2409.	Vector and clearance - acknowledged (F.O.).						09			02	4	3	2	
2410.	Altitude selector - set to 5,000' (F.O.).						12			03	3	3	2	
2411.	Altitude selector - pull out.						14			02	3	3	2	
2412.	FCS arm annunciator - shows ALT.						16			02	3	2	2	
2413.	Vertical speed selector - set to 1,000 fpm down (Capt).						29			13	4	2	2	
2414.	Auto pilot - descends airplane, & turns to 250°.						30			01	3	2	2	
2415.	Auto throttle - adjusts to maintain 163 knots.						33			03	3	2	2	
2416.	FCS pitch annunciator - shows VERT SPD.						35			02	3	2	2	
2417.	Altitude - 5,750'.						45			10	3	2	2	
2418.	Altitude alert light - on.						46			01	4	3	2	
2419.	Altitude 5,250' descending.					33	15			29	3	2	2	
2420.	Altitude alert light - off.						17			02	4	3	2	
2421.	Altitude capture mode - engages.						22			05	3	2	2	
2422.	FCS pitch annunciator - shows ALT CAP.						24			02	3	2	2	
2423.	Auto pilot - levels airplane at 5,000'.						30			06	3	2	2	
2424.	Auto throttles - adjust to maintain 163 knots.						31			01	3	2	2	
2425.	Altitude hold mode - engages.						32			01	3	2	2	
2426.	FCS pitch annunciator - shows ALT HOLD.						33			01	3	2	2	
2427.	Flaps 22, speed 153 - commanded by Captain.						35			02	4	3	2	
2428.	Flap/slat handle - moved to position 22.						37			02	3	3	2	
2429.	Flap handle position pointers - move to position 22.						38			01	3	3	2	
2430.	Flap position indicator tapes - move to position 22.						40			02	3	3	3	
2431.	Speed selector - set to 153 knots.						42			02	3	3	2	
2432.	Auto throttles - adjust to slow to 153 knots.						45			03	3	2	2	
2433.	Radar vector - turn left to 170°, this is						50			05	4	3	2	
2434.	- your intercept heading,						52			02	4	3	2	
2435.	- you are cleared for approach,						54			02	4	3	2	
2436.	- cross SEXXY intersection at 4,000',						56			02	4	3	2	
2437.	- contact tower on 118.1 over ROAMY.						58			02	4	3	2	
2438.	Clearance acknowledged - First Officer.					34	00			02	3	3	2	
2439.	Heading selector - set to 170°.						03			03	4	2	2	
2440.	Auto pilot - turns airplane to 170°.	15	34	03	15	34	29			26	--	--	--	
2441.	Altitude selector - set to 4,000'.	15	34	03	15	34	06			03	4	2	2	
2442.	Altitude selector - pull out.						07			01	4	2	2	
2443.	FCS arm annunciator - shows ALT.						08			01	3	2	2	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2444.	Vertical speed selector - 1,000 fpm down (Capt).	15 34 08	15 34 10	02	4	2	2	
2445.	Altitude - 4750' descending.			25	15	3	2	2
2446.	Altitude alert light - on.			27	02	4	3	2
2447.	Altitude - 4250' descending.			55	28	3	2	2
2448.	Altitude alert light - off.			56	01	4	3	2
2449.	Altitude capture mode - engage.			57	01	3	2	2
2450.	FGS pitch annunciator - shows ALT CAP.			59	02	3	2	2
2451.	FGS arm annunciator - goes blank.		35	00	01	3	2	2
2452.	Auto pilot - levels airplane at 4,000'.			10	10	3	2	2
2453.	FGS pitch annunciator - shows ALT HOLD.			12	02	3	2	2
2454.	Auto throttles - adjust to hold 153 knots.			15	03	3	2	2
2455.	ILS mode selector - press (Capt).			18	03	4	2	2
2456.	FGS arm annunciator - shows ILS.			20	02	3	2	2
2457.	Gear down - ordered by Captain.			22	02	4	3	2
2458.	Gear handle - down (F.O.).			24	02	3	3	2
2459.	Response - gear down (F.O.).			25	01	4	3	2
2460.	Gear indicator lights - red.			26	01	3	3	2
2461.	Gear indicator lights - green.			40	14	3	3	2
2462.	Brake pressure gages - indicate normal pressure.			42	02	3	3	2
2463.	Spoiler handle - raised to arm positon (F.O.).			45	03	3	3	3
2464.	Final descent checklist - ordered by Captain.			47	02	4	2	3
2465.	Final descent checklist - read by S.O. response as approp.			49	02	3	3	3
2466.	Ignition - continuous B (F.O.).			51	02	3	3	3
2467.	Flight and nav. instruments - x-checked, no flags (F.O.).			53	02	3	3	3
2468.	Gear - down, 3 green (F.O.).			55	02	3	3	3
2469.	Flaps - 22, take off light (F.O.).			57	02	3	3	3
2470.	Brake pressure - normal (F.O.).			59	02	3	3	3
2471.	Spoilers - armed (F.O.).		36	01	02	3	3	3
2472.	Annunciator lights - checked (F.O.,S.O.).			03	02	3	3	3
2473.	Checklist complete announcement - Second Officer.			04	01	4	2	3
2474.	#2 ADF/VOR selectors - ADF (Capt, F.O.).			05	01	4	3	2
2475.	#2 ADF pointer - indicating nearly at 140° bearing to ROAMY.			06	01	3	3	2
2476.	HSI #1 course deviation bar - moving toward center line.			08	02	4	3	2
2477.	Notification passing SEXXY - requested by Captain.			11	03	4	3	2
2478.	Response 14 miles on DME - First Officer.			13	02	4	3	2
2479.	Localizer capture mode - engages.			15	02	4	3	2
2480.	FGS steer annunciator - shows LOC CAP.			17	02	3	2	2
2481.	FGS arm annunciator - still shows ILS.			19	02	3	2	2
2482.	#2 VOR DME - indicates 14 nm from ORD (SEXXY).			19	--			
2483.	Notification passing SEXXY - First Officer.			21	02	4	3	2

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2484.	Vertical speed selector - 1,000 fpm down (Capt).	15 36 21	15 36 23	02	4	2	2	
2485.	Request for altitude selector set to 2,400' - Captain.		25	02	4	3	2	
2486.	Altitude selector - set to 2,400' (F.O.).		28	03	3	3	2	
2487.	Altitude selector - pull out.		29	01	3	3	2	
2488.	FGS arm annunciator - shows both ILS and ALT.		30	01	3	2	2	
2489.	Vertical speed indicator - shows descent.		31	01	3	2	2	
2490.	Altimeter - 3,150' descending.		37 00	29	3	2	2	
2491.	Altitude alert light - on.		01	01	4	3	2	
2492.	Altimeter - 2,650' descending.		30	29	3	2	2	
2493.	Altitude alert light - off.		31	01	4	3	2	
2494.	Altimeter - 2,500' descending.		36	05	3	2	2	
2495.	DH (decision height) lights 1 & 2 - on.		37	01	4	3	2	
2496.	DH lights - press (Capt, F.O.).		38	01	4	3	2	
2497.	DH lights - off.		39	00.	4	3	2	
2498.	Altitude capture mode - engages.		39	00.	3	2	2	
2499.	FGS pitch annunciator - shows ALT CAP.		40	00.	3	2	2	
2500.	FGS arm annunciator - shows only ILS.		40	00.	3	2	2	
2501.	Auto pilot - levels airplane at 2,400'.		41	01	3	2	2	
2502.	Localizer track mode - engages (below 2,500').		42	00.	3	2	2	
2503.	FGS steer annunciator - shows LOC TRK.		42	00.	3	2	2	
2504.	FGS pitch annunciator - shows ALT HOLD.		43	00.	3	2	2	
2505.	#1 RSI & ADI glide slope pointers - moving down toward center.		43	00.	3	2	2	
2506.	VHF radio # 1 - tuned to 118.1 (ORD tower).		46	03	3	3	2	
2507.	Request 35 flaps- Captain.		47	01	4	3	2	
2508.	Flap handle - moved to position 35 (F.O.).		49	02	3	3	2	
2509.	Flap handle position indicators - move to position 35.		50	01	3	3	2	
2510.	Flap tapes - move to position 35.		53	03	3	3	3	
2511.	Target approach speed - compute (threshold speed + wind correction).		55	02	4	3	2	
2512.	Request vpeed selector set to 148 (133 + 15 corr.) - Captain.		57	02	4	3	2	
2513.	Speed selector - set to 148 (F.O.).		59	02	3	3	2	
2514.	Auto throttles - adjust to reduce to and hold 148 knots.		59	--				
2515.	Glide slope capture mode - engages.		59	--				
2516.	FGS pitch annunciator - shows GS CAP.		59	--				
2517.	FGS arm annunciator - shows APP ONLY (auto land not armed).		59	--				
2518.	Autopilot - starts to descend on glide path.		59	--				
2519.	Auto throttles - adjust to maintain speed in descent.		59	--				
2520.	ADF 2 pointer - moves to tail (passing ROAMY).		38 00	01	3	2	2	
2521.	Passing ROAMY announcement - First Officer.		02	02	4	3	2	
2522.	Marker beacon light & tone - on (ROAMY).		02	--				
2523.	Announcement - ROAMY, target speed 148 (Capt).		03	01	4	3	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2524.	Altimeter - 2385' (S.O. confirm Glide slope height at FAF). ----------	15	38	03	15	38	04			01	3	2	2	
2525.	Flight instruments & radios - monitor (S.O.).						05			01	3	2	3	
2526.	Tower contact - First Officer (at ROAMY).						06			01	3	3	3	
2527.	Clearance to land - Chicago tower.						08			02	4	3	3	
2528.	Wind - 150°/15 kts, gusts to 22 (ORD tower).						10			02	4	3	3	
2529.	Clearance acknowledged - First Officer.						12			02	4	3	3	
2530.	#2 VOR radio - tuned to 109.7 (F.O.).						14			02	4	3	3	
2531.	Altimeter - 1,667'.						15			01	4	3	3	
2532.	Announcement - 1,000' AGL - First Officer.						17			02	5	3	3	
2533.	Response - going to 867' barometric (Capt).						20			03	5	3	3	
2534.	Altimeter - 1,167'.						53			33	4	3	3	
2535.	Announcement - 500' AGL (F.O.).						55			02	5	3	3	
2536.	Response - flaps 35 (Capt).						58			03	5	3	3	
2537.	Altimeter - 967'.					39	17			19	5	3	3	
2538.	Announcement - approaching minimums (S.O.).						18			01	5	3	4	
2539.	Altimeter - 867'.						24			06	5	3	3	
2540.	Announcement - minimums (S.O.).						26			02	5	3	4	
2541.	Auto pilot disconnect button - press (Capt).						27			01	6	3	3	
2542.	Auto pilot disengage lights - flashing.						28			01	5	3	3	
2543.	Auto pilot disengage button - press again.						29			01	6	3	3	
2544.	Auto pilot disengage warning lights - off.						30			01	5	3	3	
2545.	Radio altimeter - 50'.						52			22	5	3	3	
2546.	Auto throttles - retard.						53			01	5	3	3	
2547.	Auto throttle annunciator - shows RTD.						54			01	5	3	3	
2548.	Announcement - 50' (S.O.).						55			01	6	3	4	
2549.	Radio altimeter - 30'.						56			01	5	3	3	
2550.	Announcement - 30' (S.O.).						57			01	6	3	4	
2551.	Radio altimeter - 10'.						58			01	5	3	3	
2552.	Announcement - 10' (S.O.).						59			01	6	3	4	
2553.	Landing struts - compress (touchdown).					40	00			01	5	3	3	
2554.	Throttles - idle.						01			01	5	3	3	
2555.	Spoiler handle - moves full aft.						02			01	5	3	4	
2556.	Spoiler indicator tapes - show full spoilers.						03			01	5	3	3	
2557.	Control column - forward (Capt).						04			01	5	3	3	
2558.	Nose strut - compress (ground shift).						05			01	5	3	3	
2559.	Engine idle RPM - reduces from flight to ground idle.						05			--				
2560.	Cabin outflow valve - opens (depressurization).						05			--				
2561.	#2 throttle reverse interlock - releases.						05			--				
2562.	Pitot heat amperage - reduces.						05			--				
2563.	ACARS send light - on then off (sending on time).						05			--				

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2564.	Landing gear safety down lock - engaged.	15	40	05	15	40	05			--				
2565.	Throttle reverse levers - lifted to reverse range (Capt).						08			03	5	2	2	
2566.	Auto throttle switches - disengage automatically.						09			01	5	2	2	
2567.	Brake pedals - depress (Capt)/						12			03	6	2	2	
2568.	Reverse valve open lights - on.						13			01	6	2	3	
2569.	Reverse unlock lights - on.						14			01	6	2	3	
2570.	Reverse thrust lights - on.						15			01	6	2	3	
2571.	Reverse unlock lights - off.						16			01	6	2	3	
2572.	Reverse valve open lights - off.						17			01	6	2	3	
2573.	N1 RPM - applied in reverse as necessary(Capt).						46			29	6	2	2	
2574.	Airspeed - reducing.						47			01	5	2	2	
2575.	Reverse levers - return to forward thrust, prior to 60 kts.						50			03	5	2	2	
2576.	Reverse valve open lights - on.						51			01	3	2	3	
2577.	Reverse unlock lights - on.						52			01	3	2	3	
2578.	Reverse thrust lights - off.						53			01	3	2	3	
2579.	Reverse unlock lights - off.						54			01	3	2	3	
2580.	Reverse valve open lights - off.						55			01	3	2	3	
2581.	Flight director switches - off (Capt, F.O.).						57			02	3	3	2	
2582.	FGS annunciators - all go blank.						58			01	3	3	2	
2583.	Clearance to ground control on 121.9 (when able) - Chicago tower.					41	00			02	4	3	2	
	TAXI IN AND PARK PROCEDURES													
2584.	Anti skid switch - off (Capt).	15	41	00	15	41	01			01	4		2	
2585.	Anti skid fail annunciator lights - on.						02			01	3		2	
2586.	Spoiler handle - depress.						03			01	4		2	
2587.	Spoiler handle - returns to stowed position.						04			01	3		2	
2588.	Spoiler indicator tapes - retract to zero.						04			--				
2589.	Request flaps retracted - Captain.						06			02	4	3	2	
2590.	Flap/slat handle - moved to up/retract position(F.O.).						09			03	3	3	2	
2591.	Slat land light - off.						11			02	3		3	
2592.	Slat disagree light - on.						12			01	3		3	
2593.	Slat disagree light - off.						14			02	3		3	
2594.	Flap tapes - move to zero.						15			01	3		3	
2595.	HF radio switches - off (F.O.).	15	41	00	15	41	01			01		3		
2596.	Widshield anti ice switches - off.						02			01		3		
2597.	Windshield defog switches - off.						03			01		3		
2598.	Pitot heat switch - off.						04			01		3		
2599.	Engine anti ice switches - off.	15	41	09	15	41	10			01		3		
2600.	DME 1 & 2 - stand by.						13			03		3		
2601.	Radar - stand by.						15			02		3		

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2602.	INS data selector - track/ground speed.	15	41	15	15	41	17			02	4	3		
2603.	Safe taxi speed - mintain (using INS).						20			03	3	3		
2604.	ACARS VOX mode - select (S.O.).	15	41	15	15	41	17			02			3	
2605.	Chicago ramp - contact to confirm gate E 11 W.						20			03			3	
2606.	Response - gate confirmed, &						22			02	3	2	3	
2607.	wheel chairs waiting.						24			02	3	2	3	
2608.	Captain notified gate E 11 W confirmed - Second Officer.						26			02	4	2	3	
2609.	ACARS data mode - selected.						28			02	3	2	3	
2610.	VHF radio 1 - tuned to 121.9.						33			05	3	3	2	
2611.	Chicago ground - contact (F.O.).						36			03	3	3	2	
2612.	Cleared left at next high speed, &						39			93	4	3	2	
2613.	hold short of outer taxi way - Chicago ground.						41			02	4	3	2	
2614.	Clearance acknowledged - First Officer.						43			02	3	3	2	
2615.	Brake pressure - checked normal (F.O., S.O.).						45			02	3	3	3	
2616.	APU oil quantity - checked normal (4 quarts minimum).						47			02	3	2	3	
2617.	APU master switch - on (S.O.).						49			02	3	2	3	
2618.	APU door open light - on.					42	09			20	3	2	3	
2619.	APU master switch - start/run.						11			02	3	2	3	
2620.	APU oil pressure low light - on						12			01	3	2	3	
2621.	APU generator off light - on.						13			01	3	2	3	
2622.	N2 RPM - increasing.						14			01	3	2	3	
2623.	EGT - increasing.						29			15	3	2	3	
2624.	N1 - increasing.						30			01	3	2	3	
2625.	N2 RPM - increasing through 50%.						45			15			3	
2626.	APU oil pressure low light - off.						46			01			3	
2627.	APU generator off light - off.						50			04			3	
2628.	APU power available light - on.						53			03			3	
2629.	APU generator bus switches 1, 2 & 3 - on (S.O.).						54			01			3	
2630.	Galley power & coffee bar switches - off.						57			03			3	
2631.	Turn off to taxi way - Captain.	15	42	30	15	42	47			17	4	2		
2632.	Request of #2 engine is ready for shut down - Captain.						50			03	4	2		
2633.	Maximum EGT on final approach - not over 650°.						50			--				
2634.	Maximum EGT in reverse thrust - not over 750°.						50			--				
2635.	Out of reverse thrust - minimum of 1 minute.						50			--				
2636.	Response - ready for shut down on 2 (S.O.).						52			02	4	2	3	
2637.	Shut down #2 engine - ordered by Captain.						55			03	4	3		
2638.	#2 fuel lever - off (F.O.).					43	00			05	4	3		
2639.	Cabin outflow valve - verify full open (S.O.).	15	42	57	15	43	00			03			3	
2640.	Cabin vertical speed - zero.						02			02			3	
2641.	Cabin altitude - approx 667".						04			02			3	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL			REMARKS
											CAP.	F.O.	S.O.	
2642.	Log book - open (S.O.).	15	43	04	15	43	12			08			3	
2643.	Notify Captain airplane blocking taxi way - First Officer.	15	43	00	15	43	04			04	4	3		
2644.	Throttles - close (Capt).						07			03	4	2		
2645.	Brakes - on (holding position until cleared to cross).						12			05	4	2		
2646.	Hydraulic motor pumps - off (S.O.).						16			04	3	2	3	
2647.	Transponder - standby (F.O.).						19			03	3	3	2	
2648.	Rudder standby power - off (S.O.).						22			03	3	2	3	
2649.	Hydraulic cue light - on.						24			02	3	2	3	
2650.	Master caution light - on.						26			02	3	2	3	
2651.	Hydraulic cue light - press (S.O.).						31			05	3	2	3	
2652.	Master caution and cue lights - out.						36			05	3	2	3	
2653.	Radio call - American blocking taxi way, pull up. (Chicago ground).						41			05	3	2	2	
2654.	Response - sorry, moving (American).						46			05	4	2	2	
2655.	#2 generator off light - on.						49			03	3	2	3	
2656.	#2 APU power in use light - on.						52			03	3	2	3	
2657.	#2 AC bus tie isolate light - on.						55			03	3	2	3	
2658.	Electric cue light - On.						57			02	3	2	3	
2659.	Master caution lights - on.						59			02	3	2	3	
2660.	Electric cue light - press (S.O.).					44	00			01	3	2	3	
2661.	Cue and caution lights - off.						05			05	3	2	3	
2662.	#2 CSD oil low pressure light - on.						24			19	3	2	3	
2663.	Electric cue light - on.						25			01	3	2	3	
2664.	Master caution lights - on.						26			01	3	2	3	
2665.	Electric cue light - press (S.O.).						31			05	3	2	3	
2666.	Cue and caution lights - off.						34			03	3	2	3	
2667.	#2 engine driven pump hyd pressure low lights - on.						39			05	3	2	3	
2668.	Hydraulic cue light - on.						40			01	3	2	3	
2669.	Master caution lights - on.						42			02	3	2	3	
2670.	Hydraulic cue light - press (S.O.).						47			05	3	2	3	
2671.	Cue and caution lights - off.						52			05	3	2	3	
2672.	Clearance to cross outer taxi way - Chicago ground.						55			03	4	3	2	
2673.	Clearande to cross - acknowledged (F.O.).						58			03	3	3	2	
2674.	Notify Captain truck approaching on ramp - First Officer.					45	06			08	4	3	2	
2675.	Traffic acknowledged - Captain.						08			02	4	3	2	
2676.	Request gate chart - Captain.						10			02	4	3	2	
2677.	Consult gate chart for orientation on ramp - Captain.						35			25	4	3	2	
2678.	Gate in view - Captain/First Officer.						36			01	4	3	2	
2679.	Man at gate - in view.						37			01	4	3	2	
2680.	Lead in lights - in view.						38			01	4	3	2	
2681.	Steer to align red and green lead in lights - Captain.						50			12	4	3	2	

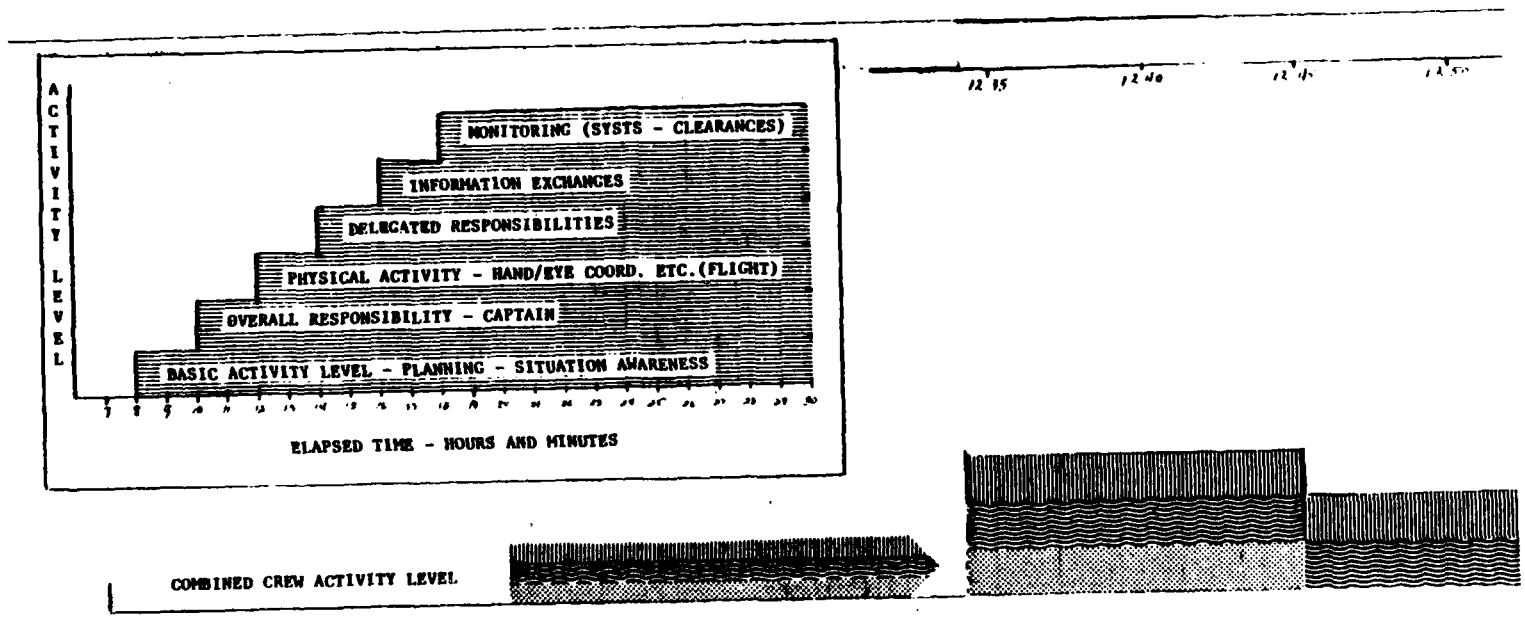
	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2682.	Brakes - on so as to stop at red alignment lights (Capt). ----------	15 45 50	15 45 52	02	4	2	2	
2683.	Brake pedals - depress and hold.		53	01	3	1	1	
2684.	Parking brake lever - pull aft and hold.		54	01	2	1	1	
2685.	Brake pedals - release.		55	01	1	1	1	
2686.	Parking brake lever - release.		56	01	1	1	1	
2687.	Park brake on lights - on.		57	01	1	1	1	
2688.	Seat belt sign switch - off.		59	02	2	1	1	
2689.	Stabilizer trim handles - hold forward.		46 00	01	2	1	1	
2690.	Stabilizer trim ind. - moves to top of green band.		01	01	2	1	1	
2691.	Trim handles - release.		02	01	2	1	1	
2692.	Engine bleed switches - off (S.O.).		04	02	2	2	2	
2693.	INS 1 & 2 way point change switches - press.		06	02	2	2	1	
2694.	Keys 1 & 9 press (Capt & F.O.).		08	02	2	2	1	
2695.	From/to windows - show 1/9.		10	02	2	2	1	
2696.	Data selectors 1 & 2 - dist/time.		12	02	2	2	1	
2697.	Displays - show distances #1 - 2 nm & #2 1 nm. (log if over 25 nm).		14	02	2	2	1	
2698.	Data selectors - XTK/TKE.		16	02	2	2	1	
2699.	Displays - show 3 & 5 nm (log if over 25 nm).		18	02	2	2	1	
2700.	INS mode selectors 0 off.		21	03	2	2	1	
2701.	Request of S.O. is ready for shut down - Captain.		23	02	2	1	2	
2702.	Response - yes (cool down time sufficient).		25	02	2	1	2	
2703.	Shut down 1 & 3 - Captain.		27	02	2	2	1	
2704.	1 & 3 fuel levers - off (F.O.).		32	05	1	2	1	
2705.	1 & 3 generator off lights - on.		36	04	1	1	2	
2706.	1 & 3 APU power in use lights - on.		37	01	1	1	2	
2708	Engines - not running		39	01	1	1	1	
2709.	APU isolation valve switch - open.		41	02	1	1	2	
2710.	1, 2 & 3 flow meters - normal.		44	03	1	1	2	
2711.	Airconditioning - checked.		46	02	1	1	2	
2712.	Cabin door lights - check all on (doors disarmed).		48	02	1	1	2	
2713.	ACARS data mode - selected.		50	02	1	1	2	
2714.	Fuel quantity totalizer - reads 24,200#.		52	02	1	1	2	
2715.	Fuel/landing key - press (S.O.).		53	01	1	1	2	
2716.	Fuel/landing key light - on.		54	01	1	1	2	
2717.	Data display - shows FO (fuel on board).		55	01	1	1	2	
2718.	Keys 2, 4 & 2 - press!		57	02	1	1	2	
2719.	Data display - shows 242 (24,200#).		58	01	1	1	2	
2720.	Enter key - press.		59	01	1	1	2	
2721.	Data display - shows LA.		47 00	01	1	1	2	
2722.	Key 1 (Captain landed) - press.		01	01	1	1	2	

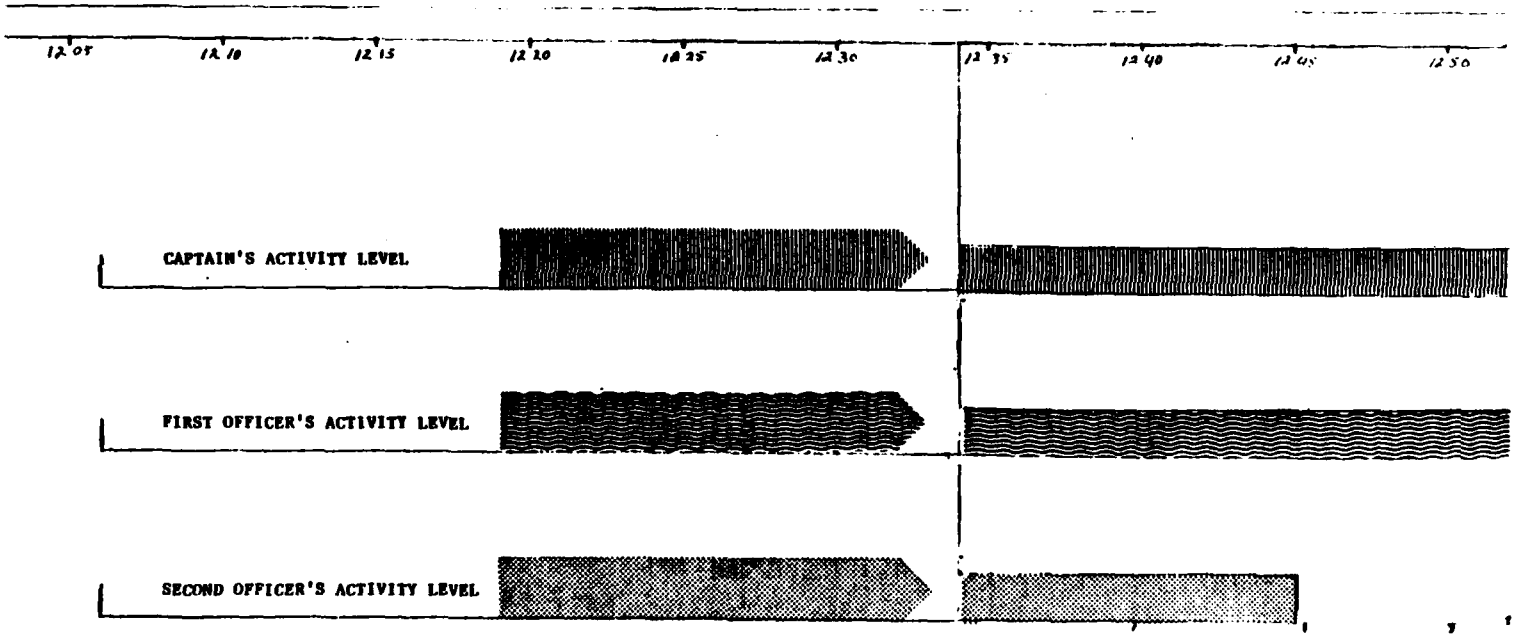
	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2723.	Data display - shows 1.	15	47	01	15	47	01			--				
2724.	Enter key - press.						02			01	1	1	2	
2725.	Fuel/landing key light - off.						03			01	1	1	2	
2726.	Send key - press.						04			01	1	1	2	
2727.	Send key light - on then off.						05			01	1	1	2	
2728.	ACARS - transmits in time, fuel & pilot at controls.						05			--				
2729.	1 & 3 CSD oil pressure low lights - on.						06			01	1	1	2	
2730.	Electric cue light - on.						06			--				
2731.	Master caution lights - on.						07			01	1	1	2	
2732.	Electrical cue light - press.						08			01	1	1	2	
2733.	Cue and caution lights - off.						09			01	1	1	2	
2734.	Checklist - read by First Officer, response by approp. crew member.						10			01	1	1	1	
2735.	Parking brake - set.						12			02	2	1	1	
2736.	Radar - off.						14			02	2	1	1	
2737.	Transponder - standby.						16			02	2	1	1	
2738.	Spoilers & flaps - retracted.						18			02	2	1	1	
2739.	Fuel levers - off.						20			02	2	1	1	
2740.	Emergency light switch - off.						22			02	2	1	1	
2741.	Ignition - off.						24			02	2	1	1	
2742.	HF radios - off.						26			02	2	1	1	
2743.	INS - off.						28			02	2	1	1	
2744.	Pitot heat - off.						30			02	2	1	1	
2745.	Motor pumps and aux pumps - off.						32			02	1	1	2	
2746.	Rudder standby power - off						34			02	1	1	2	
2747.	Air conditioning - checked.						36			02	1	1	2	
2748.	Tank pumps - off except one for the APU.						38			02	1	1	2	
2749.	Cabin door annunciator lights - all on.						40			02	1	1	2	
2750.	Windshield anti ice/defog switches - off.						42			02	2	1	1	
2751.	Battery switch - on (APU running).						44			02	1	1	2	
2752.	Cockpit and exterior lights - off (Capt, S.O. & F.O.).						47			03	2	2	2	
2753.	External power available light - on.						49			02	1	1	2	
2754.	1 & 3 engine driven hyd pump pressure low lights - on						50			01	1	1	2	
2755.	Hydraulic cue light - on.						51			01	1	1	2	
2756.	Master caution lights - on.						53			02	1	1	2	
2757.	Hydraulic cue light - press.						54			01	1	1	2	
2758.	Cue and caution lights - off.						57			03	1	1	2	
2759.	Pack switches - check on.						58			01	1	1	2	
2760.	1-2 & 1-3 isolation valve switches - check normal.						59			01	1	1	2	
2761.	1-2 & 1-3 isolation valve disagree lights - off.					48	00			01	1	1	2	

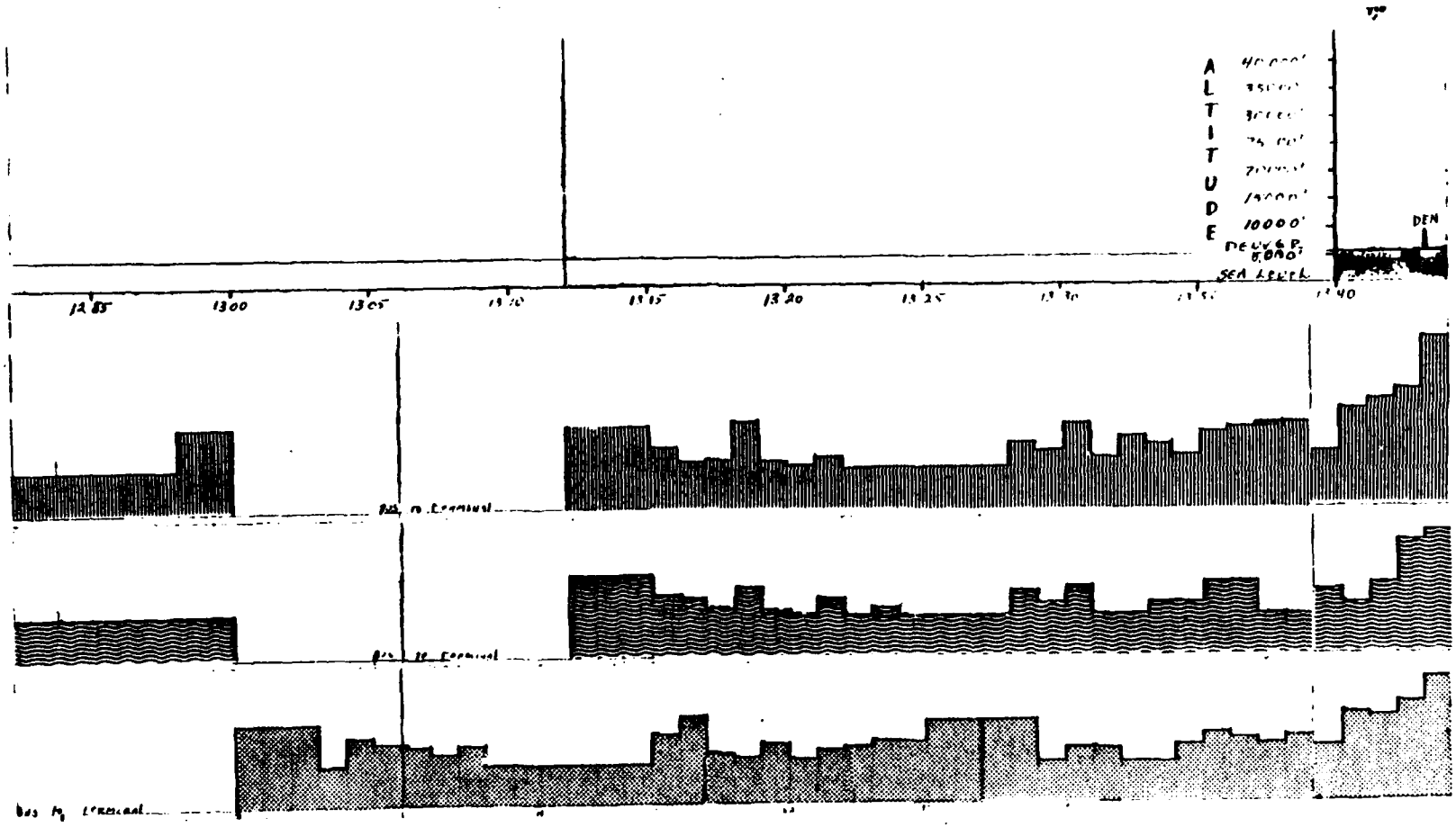
DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL			REMARKS
										CAP.	F.O.	S.O.	
2762. External power switch - on.	15	48	00	15	48	02			02	1	1	2	
2763. External power in use light - on.						03			01	1	1	2	
2764. APU isolation valve switch - closed.						05			02	1	1	2	
2765. APU generator bus switches 1, 2 & 3 - off.						10			05	1	1	2	
2766. AC bus tie isolate lights - out.						11			01	1	1	2	
2767. APU master switch - off.						13			02	1	1	2	
2768. Yellow capped circuit breakers - pull out.						28			15	1	1	2	
2769. APU clock time - entered in log.						30			02	1	1	2	
2770. Landing station - entered in log.						32			02	1	1	2	
2771. Landing fuel - entered in log.						35			03	1	1	2	
2772. Off time - entered in log.						37			02	1	1	2	
2773. On time - enetered in log.						39			02	1	1	2	
2774. Required service - entered in log.						44			05	1	1	2	
2775. Auto pilot approach info - entered in log.						47			03	2	1	2	
2776. INS accuracy data - entered in log.						50			03	2	1	2	
2777. Log book - signed by Captain.					49	00			10	2	1	1	
2778. APU - shuts down (90 seconds after APU isol valve closed).						35			35	1	1	1	
2779. Crew departs airplane.				15	50	00			25	1	1	1	

COMPANY REPORTS	NON ACARS REPORTS	ACARS/CREW REPORTS	AUTO-ACARS REPORTS	IMPACT OF ACARS FAILURE & REMARKS
COMMUNICATIONS CHECKLIST				
1. Departure time report (Flt. I.D.) departed (Station) at (Time) fuel on board _____ lbs. _____ gallons boarded aircraft number _____.		XX		Crew time to test & load - approx 1 min 30 sec. No comm light or other failure - add 2 min (look up freq and make voice contact.
2. Manifest check (Station) Load plan (Flt. I.D.) Manifest check.	-	XX		Crew time to request check & read check - 1 min. Failure - add 2 min + time to discover failure. [a]
3. Ground delay report - (15 minutes or more) (Flt. I.D.) Ground delay report, Departed (Station) at (Time) estimate off at _____.		XX		Crew time to enter data - 30 sec. Failure - add 2 min.
4. Off time (Flt. I.D.) off (Station) at (Time).			XX	No crew action. Failure - add 2 min.
5. Flight progress report (Flt I.D.) over (Station) at (Time) Flt. Level _____ _____ lbs. fuel on board, estimate (Station) at (Time).	XX			None. Could be expanded to cover this.
6. In flight gate and passenger connections (within 30 MIN (SAN, LAX, PSR, SBA, SFO, VTZ, SBB, OXD) gate (SAN, LAX, OXD, PSR, SBA, SFO) connections (Flt. I.D.) estimates (Station) at (Time) standing by for gate and connections.	XX			None - good area for expansion.
7. Gate assignment (Station) (Flt. I.D.) gate assignment (or confirm gate _____).	XX			None - good area for expansion.
8. Loaded and arrival time (Flt.I.D.) loaded (Station) (Time) arrived (Time). fuel on board _____ lbs. (Add runway conditions or remarks as necessary)		ARRIVED XX	LANDED XX	Arrived: Crew time to load data - 30 sec. Landed: no crew action. Failure - add 2 min.

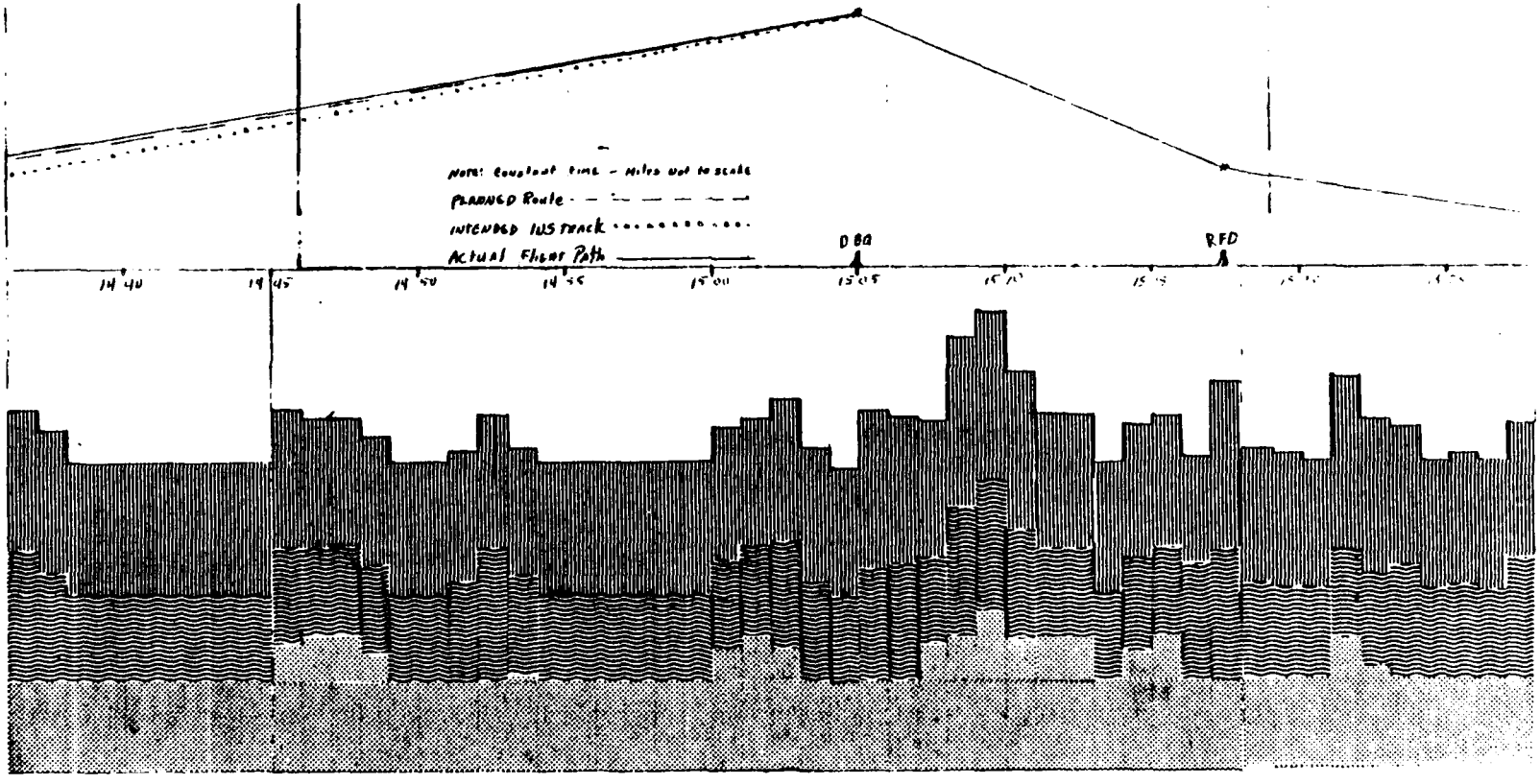
[a] During one observation, delay in receiving weight manifest check caused a 2 minute take off delay, to obtain the data by voice. If the crew had waited for ACARS it would have been a 7 1/2 minute delay.

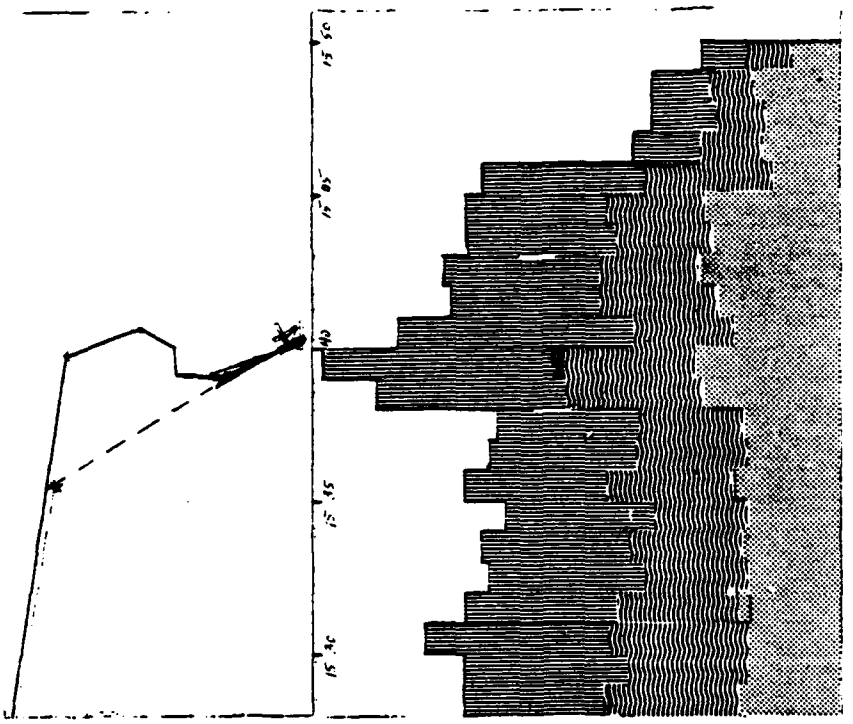

ACTIVITY LEVEL
MONITORING (SYSTS - CLEARANCES)
INFORMATION EXCHANGES
DELEGATED RESPONSIBILITIES
PHYSICAL ACTIVITY - HAND/EYE COORD. ETC.(FLIGHT)
OVERALL RESPONSIBILITY - CAPTAIN
BASIC ACTIVITY LEVEL - PLANNING - SITUATION AWARENESS
ELAPSED TIME - HOURS AND MINUTES
COMBINED CREW ACTIVITY LEVEL

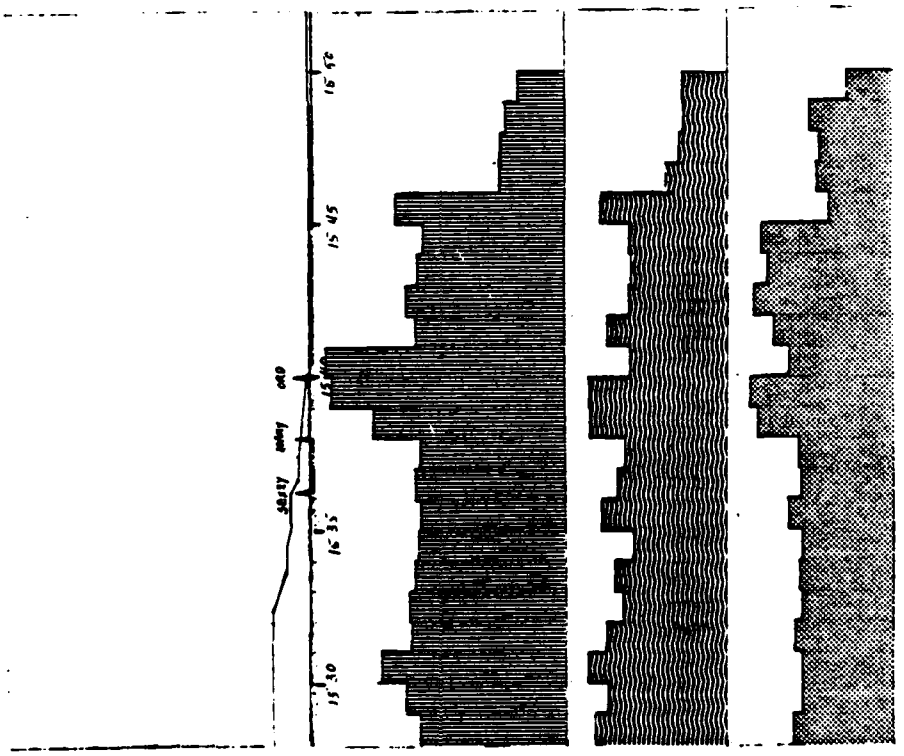

12 05
12 10
12 15
12 20
12 25
12 30
12 35
12 40
12 45
12 50
CAPTAIN'S ACTIVITY LEVEL
FIRST OFFICER'S ACTIVITY LEVEL
SECOND OFFICER'S ACTIVITY LEVEL

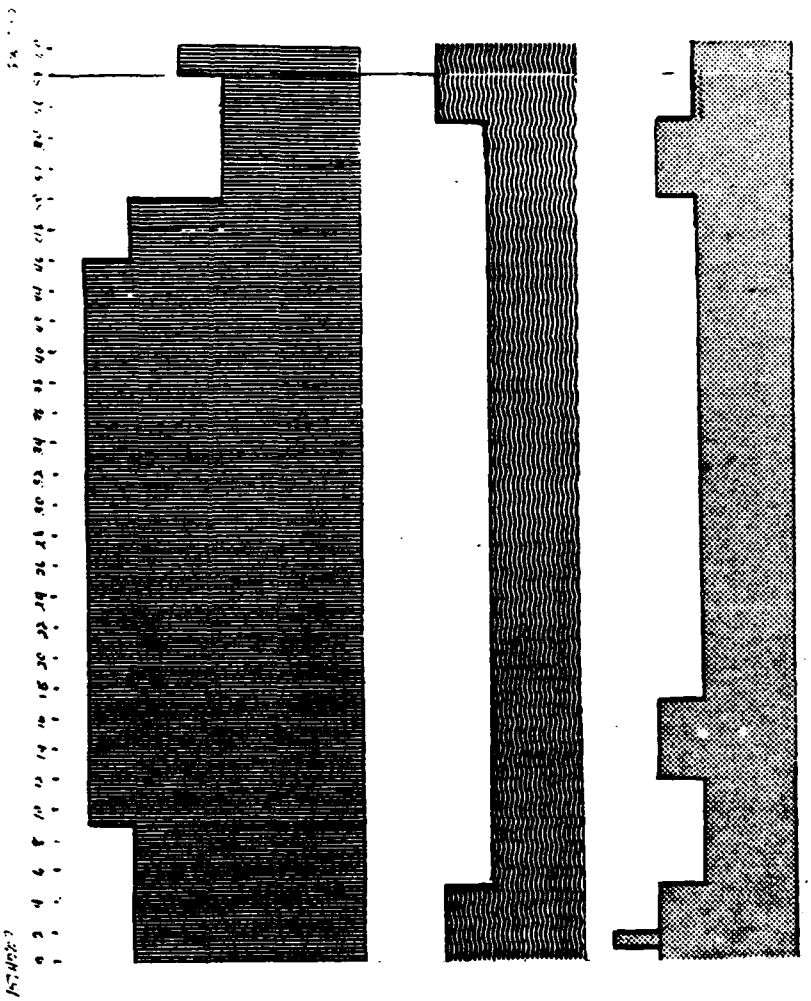

ALTITUDE
10000'
DEN
SEA LEVEL
12 55
13 00
13 05
13 15
13 20
13 25
13 40

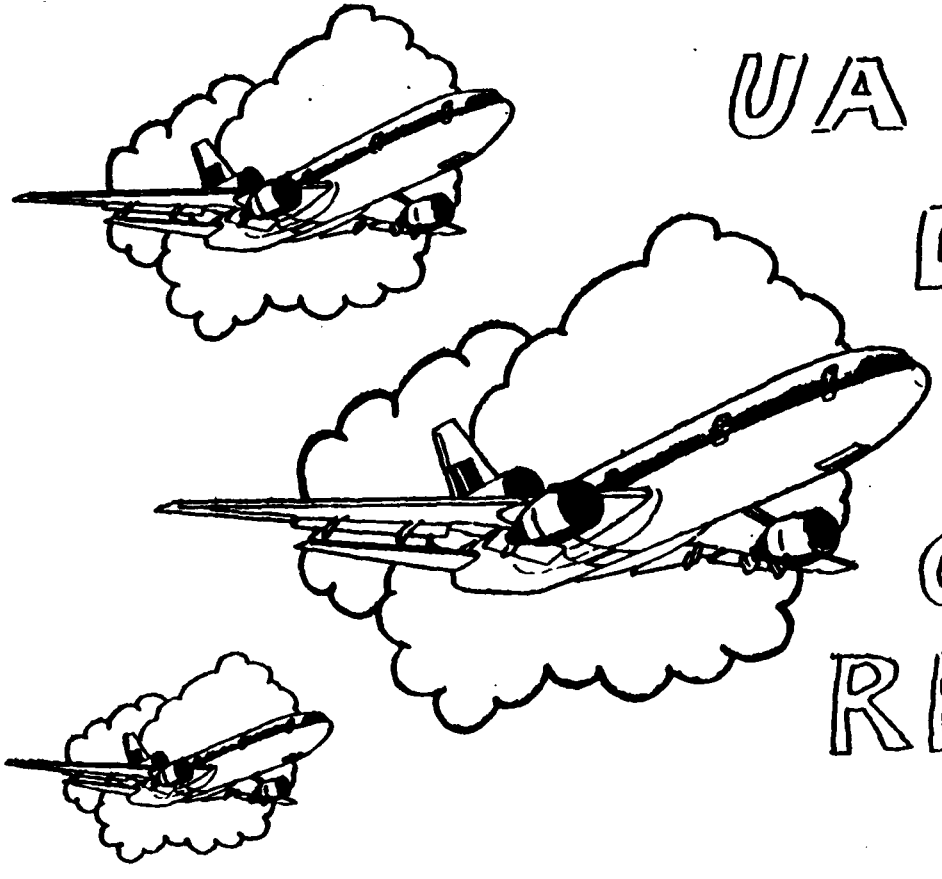
OBM
MCP
14 20
14 15
14 10
14 05
14 00
13 55
13 50


Note: Constant time - Miles not to scale
PLANNED Route
INTENDED ILS TRACK
Actual Flight Path
DBA
RFD
14 40
14 45
14 50
14 55
15 00
15 05
15 10
15 15









UA FLIGHT 280
DEN - ORD
15 JULY '82
COCKPIT DATA
REQUIREMENTS

ANNEX A

EFFECT OF HYDRAULIC AND FLIGHT CONTROL MALFUNCTION

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DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT		
15:27:30 Speed reduction to 180 knots.	Chicago approach	Traffic control.
CHICAGO APPROACH: "United two eighty, reduce now to 180 knots."		
F.O.: "Roger Chicago, understand slow to 180 - Captain George, did you copy"?		
CAPT: "Right Mike, please set 180 and extend the slats".		
15:27:38 Speed selector - set to 180.	First Officer	Throttles will slow the airplane to 180 knots.
Flap slat handle - set to 0/ext.	First Officer	Slats are required at this weight to slow below 198 knots (clean maneuvering speed).
Slat disagree light - on.	Flap/slat position ind. - F.O.	Verify slats extending.
Clean maneuvering speed - 198 knots.	Landing card	Assure safe speed.
Slat disagree light - still on and slat take off light - not on.	Flap/slat pos. ind. - F.O.	Indicates slats not extending normally.
Slats - malfunctioning.	First Officer	Alert Captain to abnormal situation.
F.O.: "Captain George, we are not getting slats".		
CAPT: "Roger, set the speed to min maneuvering, 198."		
F.O.: "Roger."		
Speed selector - set to 198.	First Officer	Maintain safe speed.
Flight control/hydraulic systs - check.	Captain - Second Officer	Determine reason for slat malfunction.
CAPT: "Matt, get the manual out for slat disagree light on."		
S.O.: "Roger".		
Hydraulic quantity, systems 1 & 3 - dropping toward zero.	Quantity gages - S.O.	Indicates hydraulic leak in two systems.
S.O.: "Captain, we are losing hydraulic quantity in both 1 & 3 systems."		
CAPT: "O.K. get out the procedure, it is probably part of our slat problem."		
S.O.: "Right. Captain George, the dual hydraulic failure procedure is quite long, we'll need some time."		
Request for clearance to holding pattern.	Captain/First Officer	Gain time to work on problem, without traffic cont. problems.
CAPT: "Mike, contact Chicago approach and ask for a holding pattern until we solve our problem."		

DATA	SOURCE	USAGE

HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T

F.O.: "Roger". "Chicago approach, United two eighty, go ahead."

CHICAGO APPROACH: "Go ahead two eighty."

F.O.: "Chicago two eighty is having some hydraulic problems. We need to hold while we do some checklists."

CHICAGO APPROACH: "Understand. Turn right to 185°, procede directly to DuPage VOR. Hold inbound on the 248° radial, right turns. Maintain 7,000', can you maintain 180 knots?"

F.O.: "Two eighty is cleared direct to DuPage VOR to hold inbound on the 248° radial, right turns. Maintain 7,000'. We are unable to slow to 180 until we solve our problem; we can go to 198 knots."

CHICAGO APPROACH: "Roger, 198 knots approved."

CAPT: "I got all that Mike, please set 185 in the heading and tune DuPage. I'll have to hand fly this so I will expect you to set all headings and altitudes and back me up on all activities."

Heading selector - set to 185°.	First Officer	Navigate to DuPage.
#1 VOR - tuned to 108.4 (DuPage).	Area chart for freq. - F.O.	" " "
NAV 1 radio - monitor for DPA	First Officer	Identify correct frequency tuned.
Distance to DPA - 32 nm.	VOR/DME	Planning.
Time to DPA - approx 9 minutes.	Dist/time	Planning.
Holding pattern entry - parallel outbnd.	Captain	Planning.
Dual hydraulic failure checklist - locate. (page I-59)	Procedures index - handbook - S.O.	Handle failure properly.
Procedure for loss of engine powering the remaining system - review.	Dual hyd fail checklist - all crewmembers.	Planning for possible engine loss.
Rudder power switch - verify armed.	Second Officer.	Assure rudder operation.
Landing - plan nearest suitable airport, max cross wind 15 kts.	Captain	Planning.
Notification of problem to cabin crew - (PA announcement later).	Second Officer (Capt's command	Call to First Flight Attendant so she can brief the other attendants.

DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
Dual hyd fail checklist con't.		
Use one hyd control at a time, trim sparingly.	Checklist	Assure adequate flight control operation.
Autopilots - off.	"	Should not be used with hyd. failure.
Engine hydraulic pump switches, normal system - both on.	"	Assure best possible flow condition.
Engine hydraulic pump switches, failed systems - off.	"	Procedure.
1-3 & 2-3 motor pump switches - off	"	Prevent overheating.
Aux pump switches 1 & 2 - stop.	"	Checklist will provide them if they can be used.
Consider fuel dump - not possible.	"	Below undumpable level.(40,000#)
Procede to hydraulic systs 1 & 3 inoperative checklist - page I-61	"	Prepare for landing with two failed hyd systs.
Hydraulic systems 1 & 3 inoperative checklist		Read by S.O.
Inoperative systems: Autopilot # 2 Slats Alternate trim Nose wheel steering Flaps may not extend at speed Slats may drift Slat disagree light may be on Ailerons and spoilers may float Control forces high Roll rate reduced Stabilizer trim reduced One elevator segment Spoilers limited Accumulator pressure only available to brakes	Considerations - all crew	Planning for approach and landing.
Brake pressure - monitor. (during landing)	Checklist	Prevent loss of brakes.
Anti skid - off.	"	" " " "

DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
Hyd 1 & 3 inop checklist con't.		
Stabilizer trim - test with handles.	Checklist	10 second test to assure operation of trim.
Stabilizer trim - functioning.	Trim indicator (moving)	Proves rudder standby system is operative.
Auto throttle switches - off.	Checklist	Procedure.
Procede to normal flap/abnormal slat checklist.	"	Preparation for approach.
Normal flaps/abnormal slats checklist.		Preparation for approach.
Slat position - extended (handle).	Checklist	Determine procedure to be used.
Landing flap position - 35.	"	Max flap position with retracted slats & will avoid spoiler float.
NOTE: Refer to landing distance table for abnormal flap/slats.	"	Assure adequate runway is available.
Threshold speed - 173 or 183	35 flap or 22 flap/slat retract speed	Used in landing distance table (not known at this time which flap setting will be available).
Runway required - 5750' to 6150'.	Landing distance table.	Assure adequate stopping performance.
Approach and land speed - compute.	Flap/slat speed table.	Prepare landing data card.
Ground prox warn system - inhibit.	Checklist	Prevent unwanted signal due to flap configuration.
Correction for gusts - compute.	Captain	Safe speed to touchdown.
Nose wheel and reverse - after landing.	Checklist - Captain	Planning reminder.
Spoiler extension - with reverse of #2 or 1 & 3.	"	Planning reminder.
Company notification:	Captain - Second Officer	Information to dispatch and ground to alert for abnormal condition, and possible delay.
CAPT: "Matt, call the Company and let them know our situation. We may need a tow in or have to unload at mid-field.		
S.O.: "Roger, will do."		
ACARS VOX mode - select.	Second Officer.	To use # 2 radio for voice communication.
VHF 2 - tune to 130.4	Freq from FOM	To call ARINC.

DATA	SOURCE	USAGE

HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T

S.O.: "ARINC, United two eighty, go ahead."

CHICAGO: "United two eighty, Chicago over."

S.O.: "Chicago, United two eighty would like to talk to dispatch."

CHICAGO: "Stand by."

DISPATCH: "United two eighty, dispatch, go ahead."

S.O.: "Dispatch, two eighty is having hydraulic problems and we are holding at DuPage until checklists are complete."

DISPATCH: "Understand, can we help?"

S.O.: "We have lost fluid from systems one and two and will not have nose wheel steering after landing. We may have to stop on the runway for tow in or offload. Be advised we have two passengers for wheel chairs. If maintenance has any suggestions please advise."

DISPATCH: "Copied okay, will stand by in case you need anything."

Holding pattern entry:

VOR pointers and to/from indicators - swing to tail.	RMI's & HSI's	Indicate station passage.
Heading selector - set to 248°.	First Officer (Capt's command).	Provide flight director steer bar to follow outbound in the holding pattern.
Elapsed time button - press.	Captain	Time outbound leg.

CAPT: "Mike, call entering the holding pattern and ask that the emergency vehicles be standing by."

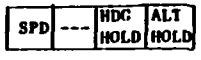
F.O.: "Chicago, United two eighty is entering the holding pattern."

CHICAGO APPROACH: "Roger two eighty, call when ready to start approach, do you want emergency equipment in place?"

F.O.: "Roger, we have two hydraulic systems out and will not have nose wheel steering. Also braking may be limited."

CHICAGO APPROACH: "Equipment will be in place."

Heading selector - press in.	First Officer (Capt's command)	Provide steer commands to hold outbound heading.



DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
Heading selector - set to 23°.	First Officer (Capt's command)	Provide inbound intercept heading.
Course selector - set to 068°.	" " " "	Inbound track reference.
Elapsed time - one minute.	Clock	Time to turn inbound.
Heading select knob - pull out.	First Officer (Capt's command).	Steer bar will command turn to intercept heading.
	SPD | --- | HDG SEL | ALT HOLD	
NAV button - press.	First Officer (Capt's command)	Reference steer bar to inbound track.
	SPD | VOR | HDG SEL | ALT HOLD	
Course deviation bar starts to move.	HSI - Captain	Indicates approaching inbound track.
VOR cap mode - engages.	FGS	Steer commands to capture track.
	ALT | --- | VOR CAP | ALT HOLD	
VOR track mode - engages.	FGS	Steer commands to track inbound radial.
	ALT | --- | VOR TRK | ALT HOLD	
Hydraulic 1 & 3 inop checklist con't:		
Go to alternate gear extension checklist page I- 70.	Checklist	Assure gear down for landing and outboard ailerons unlocked.
S.O.: "Captain George, are you ready to extend the gear?"		
CAPT: "Yes, let's get the gear down now. We have plenty of fuel and that will be out of the way."		
Max air speed - 230	Checklist & limits	Safe speed for doors etc.
F.O.'s seat - aft & right	Checklist note	Access to alternate gear handle.
Alternate extension lever cover - open.	Fi-st Officer	" " " " "
Alternate lever - pull up & latch.	First Officer	Extend gear and unlock out board ailerons.
Gear ind. lights - green.	F.O. - S.O.	Indicate gear locked down.

DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
Alt gear ext. checklist con't:		
Gear handle - down.	Checklist - F.O.	Prevent inadvertent retraction after landing.
No. 1 hyd pressure- zero.	Pressure gage - S.O.	Nose wheel steering unavailable after landing.
Return to hyd fail syst 1 & 3:		
VMCA - check (145 kts)	limits	Plan for engine out contingency.
Checklists complete.		
	S.O.: "Captain George, the checklists are completed and I'm ready to revise the landing data card. So we are about ready to start the approach. I'll put speeds on the card for both 22 and 35 in case the flaps hang up."	
	CAPT: "Right, thanks Matt, that will be fine, and let's not forget the normal final descent check also."	
Heading selector - set to 235°.	First Officer (Capt's command)	Prepare to turn out bound in holding pattern.
VOR pointers & to/from indicators - swing.	RMI's & HSI's	Indicate station passage.
Heading selector - pull out.	First Officer (Capt's command)	Start turn (steer bar commands).
	SPD | --- | HDG SEL | ALT HOLD	
Heading selector - set to 248°	First Officer (Capt's command)	Establish out bound heading reference.
Elapsed time button - press.	Captain	Start time outbound.
Landing data card - hand to S.O.	First Officer	For revision.
Cabin announcement:		
	CAPT: "Ladies and gentlemen, we have experienced a minor hydraulic problem which has caused a short delay. We are about to start our landing approach and may have to stop on the runway. We do not anticipate any difficulties, but to be sure that exit procedures are fresh in your minds, please review the card in the pocket in front of you."	

DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
Heading selector - push in.	First Officer (Capt's command)	Prepare to turn inbound, steer commands hold 248°.
	SPD | --- | HDG HOLD | ALT HOLD	
Heading selector - set to 023°	First Officer (Capt's command)	Reference FGS to intercept heading.
Elapsed time - one minute.	Clock - Captain	Time to turn inbound.
Heading selector - pull out.	First Officer (Capt's command)	Steer bar commands turn to 023°.
	SPD | --- | HDG SEL | ALT HOLD	
NAV button - press.	First Officer (Capt's command)	Arm FGS to capture inbound radial.
	SPD | VOR | HDG SEL | ALT HOLD	
VOR capture mode - engages.	FGS	Steer bar commands turn inbound.
	SPD | --- | VOR CAP | ALT HOLD	
VOR track mode - engages.	FGS	Steer bar will command 248° track to station.
	SPD | --- | VOR TRK | ALT HOLD	
Landing data card - revised.	Abnorm slat/norm flap checklist - S.O.	Provide safe approach and land speeds.

FLAP/SLAT SPEED TABLE

CONFIGURATION	AIRSPEEDS		
Flap/Slat	Maneuvering	Approach	Threshold
15°/RETRACT	Ref + 85		
22°/RETRACT	Ref + 80	Ref + 60	Ref + 55
22°/EXTEND	-	Ref + 20	Ref + 15
35°/RETRACT	-	Ref + 50	Ref + 45

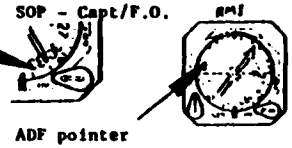
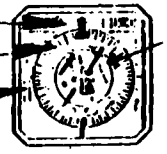
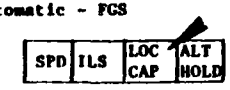
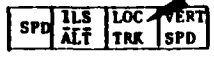
CLEAN 198 SLAT —
Dual Hyd Fail. MAN$_{15}$ —
22/Ret / 35/Ret MAN$_{22}$ —
188 / 178 $_{+50}$ $_{+60}$ $_{V_{APP_{30}}}$ —
183 / 173 $_{+55}$ $_{+45}$ $_{V_{THRESH_{30}}}$ —

REF | 128

DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
Data card - to Captain.	Second Officer	To set airspeed reminder bugs.
Approach clearance:		
CAPT:	"Are we all ready to make the approach?"	
CREW:	"Roger, all set."	
F.O.:	"Chicago approach, United two eighty is ready to start approach."	
CHICAGO APPROACH:	"Roger, you are cleared to depart DuPage, heading 030°, descending to 5,000'.	
F.O.:	"Understand two eighty is cleared to depart DuPage on a heading of 030°, and to descend to 5,000'."	
Final descent check list - complete.	Capt's command	Read by S.O., response by appropriate member.
	FINAL DESCENT CHECKLIST	
	IGNITION -	CONTINUOUS (F/O)
	FLIGHT AND NAV INSTRUMENTS -	CROSS CHECKED NO FLAGS (F/O)
	GEAR -	DOWN, THREE GREEN (F/O)
	FLAPS -	ZERO, DISAGREE LIGHT ON (F/O)
	BRAKE PRESSURE -	NORMAL (F/O)
	SPOILERS -	ARMED (F/O)
	ANNUNCIATOR LIGHTS -	CHECKED (F/O,S/O)
S.O.:	"Checklist complete."	
RMI pointers and to/from ind. - swing.	RMI's & HSI's	Station passage.
Heading selector - set to 030°.	First Officer (Capt's command)	Follow vectors.
Heading selector - pull out.	" " " "	Steer bar will now command turn to vector heading.
	SPD | --- | HDG SEL | ALT HOLD	
Altitude selector - set to 5,000 & arm.	First Officer (Capt's command)	Assure level off at clrd alt.
	SPD | ALT | HDG SEL | ALT HOLD	
Vertical speed wheel - set to 1,000 down.	First Officer (Capt's command)	Start descent, pitch bar will command 1,000 fpm down
	SPD | ALT | HDG SEL | VERT SPD	

DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
Altitude alert light - on.	Air data computer	Passing 5,750', for 5,000'.
Altitude alert light - off.	" " "	Passing 5,250'.
Altitude capture mode - engages.	FCS	Pitch bar will now command a level off at 5,000'.
	SPD | --- | HDG SEL | ALT CAP	
Altitude hold mode - engages.	FCS	Pitch bar will command level flight at 5,000'.
	SPD | --- | HDG SEL | ALT HOLD	
Turn to intercept heading - Chicago approach:		
CHICAGO APPROACH:	"United two eighty, turn right to 095°, this is your intercept heading. You are cleated for ILS approach to 14 right. Cross SEXXY at 4,000' contact tower on 119.1 at ROAMY."	
F.O.:	"*Turning* to 095°, descending to 4,000'. Tower on 118.1 at ROAMY."	
Heading selector - set to 095°.	First Officer (Capt's command)	Steer bar commands turn to 095°.
Altitude selector - set and arm 4,000'.	" " " "	Assure level off at 4,000'
Vertical speed wheel - set 1,000 down.	" " " "	Begins descent. (steer bar commands).
	SPD | ALT | HDG SEL | VERT SPD	
Flaps - 22, speed 188.	*Captain - landing card*	*Establish 22 flap maneuvering configuration.*
Flap handle - set to position 22.	First Officer	" " " " "
Flap handle position indicators - 22.	Flap position indicator	
Flap tapes - move to position 22.	" " "	Indicates flaps moving to selected position.
VOR NAV radio 1 - tuned to 109.7.	Freq from approach plate - F.O.	Prepare for approach.
Course selector - set to 140°	*App plate - First Officer*	" " "
VOR NAV radio 2 - tuned to 113.9 ORD VOR.	" " " "	Use DME to identify SEXXY.
Altitude alert light - on.	CADC	750' above level off at 4,000'.
Altitude alert light - off.	CADC	250' above level off.

DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
Altitude capture mode - engages.	FCS SPD | --- | HDG SEL | ALT CAP	Pitch bar will provide level off commands.
NAV button - press.	Captain SPD | ILS | HDG SEL | ALT CAP	Arm for ILS.
Altitude hold mode - engages.	FCS SPD | ILS | HDG SEL | ALT HOLD	Pitch commands will now maintain 4,000'.

DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
FINAL APPROACH AND LANDING CON'T		
ILS approach:		
#2 ADF/VOR selectors - ADF	SOP - Capt/F.O. 	Verify passage of ROAMY locator, and compare bearing with ILS course.
Bearing to ROAMY - nearing 140°	ADF pointer	Indicates nearing approach course.
Course indicator shows:		
Heading - 095°		
ILS course - 140°		
Course bar - moving in		Indicates nearing approach course.
	CAPT: "The course bar is off the peg. Let me know when we pass SEXXY."	
	F.O.: "Right, that'll be 14 miles on the DME."	
15:37:15 Localizer capture mode - engages	Automatic - FCS 	Captain turns the airplane to intercept and track the localizer.
14 miles from ORD (SEXXY int.)	DME tuned to ORD - F.O.	Identify position.
Vertical speed wheel - 1,000 FPM down	SOP - Capt	Initiate descent to approach altitude.
	CAPT: "Set and arm 2400'."	
	F.O.: "Roger 2400'"	
Altitude selector - 2400' & pull out	Capt - F.O. (altitude from the approach plate) 	Arms FCS so that pitch bars command capture of sel. altitude. Auto throttle will continue to hold the selected 22 flap speed 188 kts.
Radio altitude - passing below 2,500'	Radio altimeter	Alerts crew to flight situation.
Decision height lights on	Capt & F.O.	Press to extinguish and rearm.
Localizer track mode - engages	Automatic - FCS (cannot engage in track until below 2,500' radio altitude) 	Steer bar will track the localizer to the runway.

DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
FINAL APPROACH AND LANDING CON'T		
Altitude - 2,400'	Altimeter - FCS SPD | ILS | LOC TRK | ALT HOLD	Capture selected altitude.
Glide slope pointer - nearing center.	HSI - ADI	Indicates approaching glide slope.
VHF comm 1 - tune to 118.1	Approach plate - F.O.	prepare for tower contact at ROAMY.
Landing flaps - set.	Captain - F.O.	Set landing configuration.
CAPT: "Flaps 35, speed 180 if flaps go to 35.)		
F.O.: "Roger 35, 180."		
Flap handle - position 35.	First Officer	Select landing flaps.
Flap tapes - 35.	Flap indicator	Confirms flaps did travel to 35.
Slat ind. lights - disagree lts on	Flap indicator	Slat position uncertain.
Speed selector - 180.	First Officer	Set auto throttle to approach speed.
Glide slope capture mode - engages.	FCS	Following pitch bar will track glide slope.
APP ONLY - annunciates.	SPD | APP ONLY | LOC TRK | GS CAP	Indicates no auto land.
Glide slope track mode - engages.	FCS SPD | APP ONLY | LOC TRK | GS TRK	Pitch bar referenced to glide slope.
Crossing ROAMY:		
ADF needle swings to tail	RMI/ADF	Indicates station passage.
Marker beacon - light and tone.	Marker panel	Indicates station passage.

	DATA	SOURCE	USAGE
	HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
	FINAL APPROACH AND LANDING CON'T		
	Final approach fix and target speed - call.	SOP - Capt	Verbal identification of the fix and speed to assure cross check by other crew members, and make sure the command speed bug is set.
		CAPT: "ROAMY - my target approach speed is 180 knots."	
	Altitude - 2385'	Altimeter/approach plate - Second Officer	Verification of glide path height at the final approach fix.
	Flight instruments and radios - monitor	SOP - S.O.	Verify any discrepancy or evidence of destabilization.
	Tower contact - landing clearance	F.O.	Get landing clearance.
		F.O.: "Chicago tower, United two eighty heavy, ROAMY, go ahead."	
15:38:00		CHICAGO TOWER: "Roger, United two eighty heavy is cleared to land on 14 right. Wind is 150° at 15 knots with gusts to 22."	
		F.O.: "Roger, United two eighty cleared to land."	
	#2 VOR - tuned to 109.7	Approach plate - F.O.	Provides a back up ILS indication for the system already in use, and permits the First Officer to monitor the approach.
	Altitude - 1000' above grnd level - instrument check and call out and response, announcing the minimums.	SOP - First Officer & Captain & S.O.	Verify that all instruments are in agreement between left and right systems and get a response to make sure no subtle incapacitation of the Captain has occurred.
		F.O.: "1,000', instruments cross check."	
		CAPT: "Going to 867' barometric."	
15:39:25	Altitude - 500' above grnd level - cross check and final flap setting response.	SOP - First Officer & Captain & S.O.	Verify flap setting, planned reference speeds and check against incapacitation.
	Altitude - 967' (100' above min) approaching minimums call	SOP - Second Officer	Alert the Captain that he is nearing minimum alt.
	Altitude - 867' (minimums) call	SOP - Second Officer	Inform Captain that minimum altitude has been reached.
	NOTE: Preceeding two calls might not be required in the event of visual approach conditions.		
		SOP - Capt	

	DATA	SOURCE	USAGE
	HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
	FINAL APPROACH AND LANDING CON'T		
	Radio altitude 50' - Throttles retard toward flight idle.	Captain	Reduce thrust for landing.
	Altitude call outs just prior to touch down at 50, 30 & 10 feet	Radio altimeter/SOP - S.O.	Assist the Captain in judging flare.
15:40:00	Touchdown:		
	Throttles - idle	Auto throttle system/rear wheel spin-up - Capt	Throttles close to allow deceleration.
	Ground shift - nose strut compression:	Capt lowers nose wheel to runway	Switches several systems to ground operation.
	Throttles - gnd idle	Automatic	Permits lower idle for deceleration.
	Outflow valve - open	Automatic/pressure controller	Depressurizes cabin.
	#2 throttle revers interlock - release	Automatic	Permits reverse operation of #2 engine.
	Pitot heat - reduces	Automatic	Prevents over heat on the ground
15:40 +	On time - transmitted	ACARS	Radios on time to ARINC which passes info to UNIMATIC for flight following, airplane flight time, crew flight time etc.
	Landing gear handle - latch	Mechanical linkage	Prevent inadvertent gear retraction.
	Wing anti-ice - deactivates (turns off, if on.	Automatic	Prevent over heat of slat anti-ice system.
	Throttles - lift to reverse	Capt	Assist in deceleration.
	Spoilers - extend.		
	Brakes - apply - one application, held.	Capt	Deceleration.(hold brakes until stopped then set.)
	Reverse indicator lights - Reverse unlock - on/off & reverse thrust light - on	Reverse mechanism position - S.O.	Monitor reverser operation. (S.O. informs Captain of any abnormal indication.
	Engine indications - in limits	SOP - S.O.	Prevent over temp or over boost.
	Throttles - forward thrust (prior to going below 60 kts)	SOP - Capt	Taxi to ramp.
	Reverse indicator lights - reverse unlock - on/off & reverse thrust light - off	SOP - Capt/S.O.	Verify forward thrust.

DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
FINAL APPROACH AND LANDING CON'T		
Flight director switches - off	SOP - Capt & F.O.	Clear the annunciators and turn off the system.

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15:41:00 Clearance to ground control:

CHICAGO TOWER: "United two eighty, Observe you stopped on the runway, hold your position for tow vehicle on the way."

TAXI IN AND PARK

Anti skid fail annunciator lights - on	Annunciator panel - Capt	Verifies that the anti skid system is off.
Spoiler handle - push down	SOP - Capt	To retract the spoilers.
Spoiler handle - moves to retract position	Automatic	Retracts splrs to clear evac route if needed.
Spoiler tapes - zero	Flight control position indicator - Capt	Verifies spoilers retracted.
Flaps - retract	Capt - F.O. (on command)	Flaps are retracted to preclude damage from debris which might be thrown up by the wheels. (only to position 22 if snow or slush are present)

CAPT: "Flaps - up."

Flap handle - Up	F.O.	To retract the flaps and slats.
Flap tapes - zero	Flap/slat position indicator - F.O.	Verify flaps have retracted.
Slat indicator lights - disagree light on.	Flap/slat position indicator - F.O.	Indic. slats have not retracted.
Gate confirmation	Chicago ramp - S.O.	Confirm gate position.
ACARS vox mode - select	S.O.	Return VHF com 2 to voice operation.

S.O.: "Chicago ramp, United two eighty is on the ground holding on the runway for tow in."

15:41:30 CHICAGO RAMP: "Roger two eighty, Tow truck on the way. He will take you to E11W."

S.O.: "Captain, we'll be towed to E 11 W.

ACARS data mode - select	S.O.	Return to data mode for normal operation.
VHF com 1 radio - 121.9	Tower/approach page - F.O.	Contact ground control.

F.O.: "Chicago, United two eighty heavy on 121.9"

DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
TAXI IN AND PARK CON'T		
	CHICAGO GROUND: "United two eighty, have you stopped on the runway, can you shut down engines and still maintain contact?"	
	F.O.: "Roger Chicago, Can do as soon as the APU is on the line.	
Brake pressure - low, brakes set.	Sys 1 & 2 brake press gages - F.O. & S.O.	Confirm pressure to assure adequate braking.
15:42:00 APU start:	SOP - S.O.	Prepare to furnish electrical and pneumatic power so engines may be shut sown at the gate.
APU oil quantity - 4 qts min	APU control panel/flight handbook limits - S.O.	4 qts minimum is required for APU operation prior to starting. (Any amount above zero is okay after the APU is running.)
APU master switch - run	SOP - S.O.	Opens APU inlet door.
APU door open light - on	S.O.'s annunciator light panel - S.O.	Verifies that door has opened.
Master switch - Momentarily to start, then release to run	SOP - S.O.	Begins APU starting cycle.
APU oil press lo and generator off lights come on	APU control panel - S.O.	Normal starting cycle indications.
N_1, N_2 & Exhaust temp inds - increase to operating ranges	APU control panel - S.O.	Normal starting and operating indications.
APU oil pressure lo light - off	APU control panel - S.O.	Confirms adequate oil pressure for operation.
APU gen off light - out	APU control panel - S.O.	Confirms generator is operating satisfactorily.
APU power avail lt - on	APU control panel - S.O.	Confirms generator volts and frequncies normal.
APU gen bus sws 1,2 & 3 - on	SOP S.O.	APU generator will now power airplane gen buses automatically as the engines are shut down.
Galley power and coffee bar sws - off	SOP - S.O.	Reduce unnecessary electrical loads, and shut down unnecessary equipment.
Cabin outflow valve - full open	Valve position ind - S.O.	Verifies cabin has depressurized.
Cabin vertical speed - zero and cabin altitude 667' (field elevation)	Cabin press. control panel - S.O.	Verifies cabin has depressurized.
Log book entries	S.O.	Information for maintenance for airplane/engine hist.

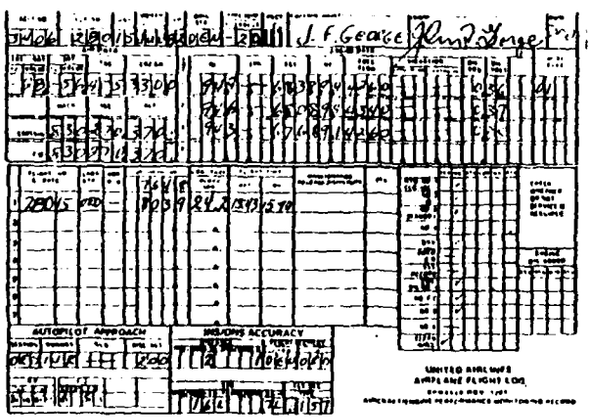
DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
TAXI IN AND PARK CON'T		
HF radio switches - off	SOP - F.O.	Turn off, if on, to reduce operating time.
Windshield anti-ice and de-fog sws - off	SOP - F.O.	Allow to cool.
Pitot heat selector - off	SOP - F.O.	Allow to cool.
Engine anti-ice sws - off	SOP - F.O.	Turn system off, if on.
DME's - standby	SOP - F.O.	No off position.
Radar - standby	SOP - F.O.	No off position.
Transponder - stand by	SOP - F.O.	No off position.
Rudder standby power - off	SOP - S.O.	Prevent operation during engine shut down.
Hydraulic motor pumps - check off	SOP - S.O.	" " " " " "
Engine shut down:		
CAPT: "Matt are you ready for shut down?"		
Max temp in reverse - less than 750°	Handbook - S.O.	Engine cooling requirement.
Out of reverse - one minute min.	Handbook - S.O.	" " "
APU electric bus sws - on	SOP - S.O.	Ready to take electrical loads.
S.O.: "Ready for shut down."		
CAPT: "Okay, Mike, fuel levers off."		
Fuel levers - off.	First Officer.	Shuts down the engines.
Tow in:		
Tow vehicle arrives and connects.	Maintenance	Tow to the gate.
Ready to tow.	Maintenance - Captain	
MAINT: "Brakes off, ready to tow in."		
CAPT: "Brakes off."		
Park brake - release.	Captain	To tow in.
Clearance to tow:		
F.O.: "Chicago ground, United 280 is ready to be towed to the gate."		

DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
TAXI IN AND PARK CON'T		
CHICAGO GROUND:	"Cleared to cross the outer taxi way and cleared to E 11 W."	
F.O.:	"Roger 280 going to the gate."	
Engine bleed switches - off.	SOP - S.O.	No longer needed.
APU isolation valve switch - open.	Second Officer	Provide pneumatics for air conditioning.
1-3 & 1-2 isolation valve disagree lts - on then off.	Second Officer	Indicates valves have opened.
Arrive at gate: MAINT:	"Brakes on."	
CAPT:	"Roger, brakes on."	
Brake pedals - depress and hold	Captain	To set brakes.
Park brake lever - pull aft.	Captain	To set brakes.
Park brake ind. lts - on.	Captain	Verify brakes set.
Brake pedals - release.	Captain	
Seat belt sign - off.	F.O.	Let passengers deplane.
INS 1 & 2 waypoint change sws - press	SOP - Capt	Preparation for shutting down the INS.
Waypoints 1 & 9 - key in	SOP - Capt	Preparation for reading distance error for the log.
Data selectors - dis/time	SOP - Capt	Read distance for the log.
Displays show - #1, 2NM & #2, 1NM	SOP - Capt	Compare with limit, must be written up if over 25 NM.
Data selectors - XTK/TKE	SOP - Capt	Read Cross track distance and write up if over 25 NM.
INS 1 & 2 mode selectors - off	SOP - Capt	Turn off the INS equipment.
Emergency light switch - off.	Captain	Disarms system to prevent inadvertent discharge of the batteries.
Fuel tank pump switches - off except #2 right aft.	Second Officer	One pump on for the APU.
Cabin door lights - check on.	Second Officer	Confirms escape slides have been disarmed.

DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T		
TAXI IN AND PARK CON'T		
15:46:50 ACARS data mode - select	SOP - S.O.	Prepare to enter fuel and landing data.
Fuel/lndg key - press	SOP - S.O.	Prepare to enter fuel and landing data.
Fuel/lndg key light - on & display shows FO (fuel on board)	Visual - S.O.	Verifies set is ready to accept information.
Key in 242 (24,200f) - display shows 242	Fuel quantity indicators, fuel remaining	Numbers in the window verify correct info has been entered.
Enter key - press	SOP - S.O.	Enters data and clears the display.
Display - shows LA	Visual - S.O.	Indicates ACARS is ready to accept pilot at the controls for landing information.
Key in 1 (Captain) - display shows 1	SOP - S.O.	Verify 1 has been selected.
Enter key - press, fuel/lndg key light - out	SOP - S.O.	Information is now ready to send.
1547:15 Send key - press.	SOP - S.O.	ACARS transmits in time as well.
Parking checklist	Cockpit card	Read by First Officer - response by appr. crewman.

PARKING BRAKE	-	SET(C)
RADAR	-	OFF(C)
TRANSPONDER	-	STANDBY (C)
SPOILERS & FLAPS	-	RETRACTED (C)
FUEL LEVERS	-	OFF (C)
EMERGENCY LIGHT SWITCH	-	OFF (C)
IGNITION	-	OFF (C)
HF RADIOS	-	OFF (C)
INS	-	OFF (C)
PITOT HEAT	-	OFF (C)
MOTOR PUMPS AND AUX PUMPS	-	OFF (S/O)
RUDDER STANDBY POWER	-	OFF (S/O)
AIR CONDITIONING	-	CHECKED (S/O)
TANK PUMPS	-	OFF EXCEPT ONE FOR THE APU (S/O)
CABIN DOOR ANNUNCIATOR LTS	-	ALL ON (S/O)
WINDSHIELD ANTI-ICE/DEFOG	-	OFF (C)
BATTERY SWITCH	-	ON, APU RUNNING (S/O)

DATA	SOURCE	USAGE
HYDRAULIC AND FLIGHT CONTROL MALFUNCTION EFFECT CON'T TAXI IN AND PARK CON'T		
Cockpit and exterior lights - off	SOP - Capt - F.O. - S.O.	Reduces heat and prolongs life of panels and lights.
APU shut down:		
External power available light - on	Visual - S.O.	Indicates external power is available and acceptable.
External power switch - on	SOP - S.O.	Powers the tie bus, so that the APU can be shut down.
APU isolation valve switch - close	SOP - S.O.	Starts the 90 second enforced idle before the APU will shut down and unloads it pneumatically for cooling.
APU generator bus sws - off	SOP - S.O.	Unloads the APU electrically.
APU power in use lights and the AC bus tie isolate lights - out	Visual - S.O.	Verifies that External power is now powering the buses.
APU master switch - off	SOP - S.O.	Shuts down the APU unless the 90 second timer has not run out. APU will shut down at the end of the time.
Yellow capped circuit breakers - pull	SOP - S.O.	Yellow caps identify breakers that are used to un-power certain equipment such as electronics so they will not stay operating and hot when not needed.
Log book completed		All data recorded and ready for the Captain's signature
15:48:20 Log book signed		
15:49:00 Crew departs the airplane.		



	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2366.	Clearance to reduce to 180 knots - chicago approach. ----------	15 27 25	15 27 30	05	4	3	2	
2367.	Speed reduction - acknowledge (F.O.).		32	02	3	3	2	
2368.	Captain requests speed selector - set to 180 &		34	02	4	3	2	
2369.	- slats extended.		36	02	4	3	2	
2370.	Speed selector - set to 180 (F.O.).		38	02	3	3	2	
2371.	Throttles - adjust to slow to 180 knots.		41	03	3	2	2	
2372.	Flap/slat handle - moved to zero/extend.		44	03	3	3	2	
2373.	Slat disagree light - on.		45	01	3	3	2	
2374a.	Slat disagree light - still on, no take off light.		47	02	3	3	2	
2375a.	Clean maneuvering speed - 198 knots.		48	01	3	3	2	
2376a.	Slats malfunctioning - noticed by F.O.		50	02	3	3	2	
2377a.	Captain notified of flap problem - First Officer.		52	02	4	3	2	
2378a.	Speed selector set to 198 - commanded by Captain.		54	02	4	3	2	
2379a.	Command acknowledged - First Officer.		56	02	3	3	2	
2380a.	Speed selector - set to 198 kts.		58	02	3	3	2	
2381a.	Captain - orders slat disagree check list.		28 00	02	4	2	3	
2382a.	Order acknowledged - Second Officer.		02	02	3	2	3	
2383a.	Hydraulic quantity, systems 1 & 2 - dropping toward zero.		04	02	3	2	3	
2384a.	Captain notified of loss of fluid - Second Officer.		06	02	4	2	3	
2385a.	Captain - orders hydraulic failure (expects it caused slat problem).		08	02	4	2	3	
2386a.	Acknowledge order, suggest extra time for solving problem - S.O.		11	03	4	2	3	
2387a.	Captain orders F.O. to request holding pattern.		14	03	4	3	2	
2388a.	Order acknowledged, approach contacted - First Officer.		19	05	3	3	2	
2389a.	Response - Chicago approach.		21	02	3	3	2	
2390a.	Request for holding pattern for hyd. problem - First Officer.		24	03	3	3	2	
2391a.	Clearance - right turn to 185°,		27	03	4	3	2	
2392a.	- direct to DuPage VOR &		30	03	4	3	2	
2393a.	hold inbound on the 248° radial, right turns,		33	03	4	3	2	
2394a.	- maintain 7,000',		36	03	4	3	2	
2395a.	Can you maintain 180knots?		39	03	4	3	2	
2396a.	Acknowledge clearance, state minimum speed 198 knots.		46	07	3	3	2	
2397a.	198 knot speed - approved (Chicago).		49	03	4	3	2	
2398a.	Request heading select - 185° and instr. F.O. to set all headings & alts.		54	05	4	3	2	
2399a.	Heading selector - set to 185 and pulled out (F.O.).		57	04	3	3	2	
2400a.	#1 VOR tuned to 108.4 (DuPage).		29 07	10	3	3	2	
2401a.	#1 VOR - monitored for DPA ident.		10	03	3	3	2	
2402a.	Distance to DPA - 32 nm DME.		12	02	3	3	2	
2403a.	Time to DPA - approx 9 minutes		14	02	3	3	2	
2404a.	Holding pattern entry - plan parallel outbound.		19	05	4	1	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
2405a.	Dual hyd. failure checklist - locate in procedure index.	15	29	19	15	29	39			20	4	3	3	
2406a.	Procedure for loss of engine powering the good syst. - review.						57			18	4	3	3	
2407a.	Rudder power switch - check armed (S.O.).					30	00			03	4	3	3	
2408a.	Notify cabin crew on interphone about delay - Second Officer.						23			20	4	3	3	
2409a.	Reminder to use one control at a time, trim sparingly - checklist.						25			02	4	3	3	
2410a.	Auto pilots - off.						28			03	5	3	3	
2411a.	Engine hydraulic pumps, good system - both on.						32			04	5	3	3	
2412a.	Hydraulic pumps on failed systems - off.						36			04	5	3	3	
2413a.	1-3 & 2-3 motor pump switches - off.						40			04	5	3	3	
2414a.	Aux pump switches - stop.						42			02	5	3	3	
2415a.	Fuel dump - not possible.						44			02	5	3	3	
2416a.	Turn to hyd. syste. 1 & 3 inop checklist - Second Officer.						46			02	5	3	3	
2417a.	Considerations - Auto pilot 2 inop.,						48			02	6	3	3	
2418a.	- slats inop.,						50			02	6	3	3	
2419a.	- alternate trim inop.,						52			02	6	3	3	
2420a.	- nose wheel steering inop.,						54			02	6	3	3	
2421a.	- flaps may not extend at speed,						56			02	6	3	3	
2422a.	- slats may drift,						58			02	6	3	3	
2423a.	- slat disagree light may be on					31	00			02	6	3	3	
2424a.	- ailerons and spoilers may float,						02			02	6	3	3	
2425a.	- control forces will be high,						04			02	6	3	3	
2426a.	- roll rate is reduced,						06			02	6	3	3	
2427a.	- stabilizer trim is slow,						08			02	6	3	3	
2428a.	- one elevator segment inop.,						10			02	6	3	3	
2429a.	- spoilers limited,						12			02	6	3	3	
2430a.	- accumulator pressure only for brakes.						14			02	6	3	3	
2431a.	Remember to monitor brake pressure - during landing.						16			02	6	3	3	
2432a.	Anti skid - off.						19			03	6	2	3	
2433a.	Stabilizer trim - test with handles.						29			10	6	2	3	
2434a.	Trim check - okay.						31			02	6	2	3	
2435a.	Auto throttle switches - off.						33			02	6	2	3	
2436a.	Turn to normal flap/abnormal slat checklist - S.O.						37			04	5	3	3	
2437a.	Slat position - handle extended.						40			03	5	3	3	
2438a.	Landing flap will be 35.						43			03	5	3	3	
2439a.	Locate abnormal flap/slat landing distance chart - S.O.						58			15	5	3	3	
2440a.	Threshold speed - 173 or 183 (depemd. on flap avail.)					32	13			15	5	3	3	
2441a.	Runway required - 5750' to 6150' (depend. on flap avail).						23			10	5	3	3	
2442a.	Approach and land speeds - compute (S.O.).						38			15	5	3	3	
2443a.	Ground prox. warning system - inhibit.						41			03	5	3	3	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2444a.	Speed correction for gusts - compute (Capt).	15	32	41	15	32	44			03	5	3	3	
2445a.	Nose wheel and reverse techniques - review.						46			02	5	3	3	
2446a.	Spoiler extension - will be on reversing not wheel spin up.						48			02	5	3	3	
2447a.	Captain orders company notified & towin probability.						51			03	6	2	3	
2448a.	Order acknowledged - Second Officer.						53			02	5	2	3	
2449a.	ACARS VOX mode - select.						55			02	5	2	3	
2450a.	VHF 2 radio - tune to 130.4.					33	00			05	5	2	3	
2451a.	ARINC - contacted (S.O.).						05			05	4	2	3	
2452a.	Call acknowledged - ARINC.						15			10	4	2	3	
2453a.	Request dispatch contact - Second Officer.						18			03	4	2	3	
2454a.	Stand by response - ARINC.						21			03	4	2	3	
2455a.	Radio call - dispatch.						41			20	4	2	3	
2456a.	Dispatch informed of problem - Second Officer.						44			03	4	2	3	
2457a.	Acknowledge conditions, offer assistance - dispatch.						47			03	4	2	3	
2458a.	Systems 1 & 2 - inop due fluid loss,						50			03	4	2	3	
2459a.	nose wheel steering - inop,						52			02	4	2	3	
2460a.	tow in or off load at mid field - probably required,						54			02	4	2	3	
2461a.	2 wheel chairs - required,						57			03	4	2	3	
2462a.	maintenance - check for suggestions.						59			02	4	2	3	
2463a.	Acknowledge all above - dispatch, standing by.					34	02			03	4	2	3	
2464a.	VOR pointers & to/from indicators - swing to tail (DuPage).						04			02	5	3	2	
2465a.	Heading selector - set to outbound hdg 248° (Capt. F.O.).						07			03	6	3	2	
2466a.	Elapsed time button - press Capt).						08			01	6	3	2	
2467a.	F. O. told to call hold pattern & emerg. equip - Captain.						10			02	6	3	2	
2468a.	Approach - contacted in holding pattern.						13			03	4	3	2	
2469a.	Call acknowledged, emerg equipment offered - Chicago.						16			03	5	3	2	
2470a.	Equip. requested, no steering, limited brake situation advised - F.O.						19			03	4	3	2	
2471a.	Request and info - acknowledged (Chicago).						22			03	4	3	2	
2472a.	Heading selector - press in (Capt/F.O.). (For hdg hold mode).						25			03	5	3	2	
2473a.	Heading selector -set to inbnd intcpt hdg (023°).						28			03	5	3	2	
2474a.	Elapsed time hand on clock - shows 1 minute.					35	08			35	6	2	2	
2475a.	Heading select knob - pull out to turn inbound.						11			03	5	3	2	
2476a.	NAV button - press to intercept VOR radial.						14			03	5	3	2	
2477a.	Course deviation bar - indicates nearing radial.						53			39	5	2	2	
2478a.	VOR capture mode - engages.					36	03			10	6	2	2	
2479a.	VOR track mode - engages.						08			05	6	2	2	
2480a.	Turn to Alternate gear extension checklist - Second Officer.						18			10	5	3	3	
2481a.	Request if Captain is ready for gear extension - Second Officer.						21			03	5	3	3	
2482a.	Response - yes, plenty of fuel, get gear down early.						25			04	5	3	3	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2483a.	Maximum alternate extend speed - 230 knots.	15 36 25	15 36 27	02	5	3	3	
2484a.	First Officer's seat - move out of the way.		31	04	5	3	3	
2485a.	Alternate gear extension cover - lift (F.O.).		34	03	5	3	3	
2486a.	Alternate gear extension lever - up and latched.		37	03	5	3	3	
2487a.	Gear indicator lights - green.		44	07	5	3	3	
2488a.	Gear handle - down.		49	05	5	3	3	
2489a.	Nose steering - unavailable (#1 hyd fluid loss).		51	02	5	3	3	
2490a.	Turn back to hyd. fail checklist.		53	02	5	3	3	
2491a.	VMCA - check (145 kts).		54	01	5	3	3	
2492a.	Captain advised checks complete, ready to revise land. data.		37 00	06	6	3	3	
2493a.	Information acknowledged - Captain.		03	03	6	2	3	
2494a.	Heading selector - set to 235° out bound heading.		06	03	5	3	3	
2495a.	VOR pointers & to/from inds. - indicate station passage.		08	02	5	2	2	
2496a.	Heading selector - pull out to turn outbound.		11	03	5	3	2	
2497a.	Heading selector - set to 240° after airplane has started turn.		16	05	5	3	2	
2498a.	Elapsed time button - press (abeam VOR).		38 08	52	6	2	2	
2499a.	Landing data card - handed to Second Officer.		13	05	5	3	3	
2500a.	Cabin announcement re problem - Captain.		28	15	6	2	2	
2501a.	Heading hold mode - selected.		31	03	5	3	2	
2502a.	Heading selector - set to intercept hdg. 023°.		36	05	5	3	2	
2503a.	Elapsed time - 1 minute.		39 08	32	5	3	2	
2504a.	Heading select mode - selected.		11	03	5	3	2	
2505a.	NAV mode - selected.		14	03	5	3	2	
2506a.	VOR capture mode - engages.		40 03	40	6	2	2	
2507a.	VOR track mode - engages.		08	05	6	2	2	
2508a.	Landing data - revised, 22flap approach speed 188 knots,		16	08	4	2	3	
2509a.	- 22 flap threshold speed 183 knots,		24	08	4	2	3	
2510a.	- 35 flap approach speed 178 knots, &		32	08	4	2	3	
2511a.	- 35 flap threshold speed 173 knots.		40	08	4	2	3	
2512a.	Data card - passed to Captain.		41	01	5	2	3	
2513a.	Request if crew is ready to make approach - Captain.		43	02	6	3	3	
2514a.	Response - affirmative (F.O./S.O.).		45	02	5	3	3	
2515a.	Chicago approach - contacted, ready for approach (F.O.).		47	02	4	3	2	
2516a.	Clearance for approach - dept. DPA 030° descend to 5,000' (Chicago).		50	03	5	3	2	
2517a.	Acknowledge clearance - First Officer.		53	03	4	3	2	
2518a.	Final descent checklist - called for (Capt).		55	02	6	3	3	
2519a.	Checklist: Ignition - continuous (S.O./F.O.).		56	01	6	3	3	
2520a.	Flight & nav instruments - cross checked/no flags (S.O./F.O.).		58	02	6	3	3	
2521a.	Gear - down, three green (S.O./F.O.).		41 00	02	6	3	3	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
2522a.	Flaps - zero, disagree light on (S.O./F.O.).	15	41	00	15	41	02			02	6	3	3	
2523a.	Brake pressure - normal (S.O./F.O.).						03			01	6	3	3	
2524a.	Spoilers - armed (S.O./F.O.).						04			01	6	3	3	
2525a.	Annunciator lights - checked (S.O./F.O.).						05			01	6	3	3	
2526a.	Announcement - checklist complete (S.O.).						07			02	5	2	3	
2527a.	RMI pointers & to/from inds. - swing passing DPA.						08			01	4	2	2	
2528a.	Heading selector - set to 030° (clearance).						11			03	5	3	2	
2529a.	Heading select mode - selected.						14			03	5	3	2	
2530a.	Altitude selector - set to 5,000' & armed.						18			04	5	3	2	
2531a.	Vertical speed selector - set to 1,000 fpm down.						21			03	6	3	2	
2532a.	Altitude alert light - on (passing 5,750').					42	36		01	15	5	2	2	
2533a.	Altitude alert light - off (passing 5,250').					43	06			30	5	2	2	
2534a.	Altitude capture mode - engages.						21			15	5	2	2	
2535a.	Altitude hold mode - engages.						26			05	5	2	2	
2536a.	Clearance - turn right to 095° & (Chicago),						28			02	6	3	2	
2537a.	- this is your intercept heading,						30			02	6	3	2	
2538a.	- Cleared for ILS to 14 right -						32			02	6	3	2	
2539a.	- cross SEXXY at 4,000' &						34			02	6	3	2	
2540a.	- contact tower on 118.1 at ROAMY.						36			02	6	3	2	
2541a.	Clearance - acknowledged (F.O.).						39			03	5	3	2	
2542a.	Heading selector - set to 095°.						42			03	6	3	2	
2543a.	Altitude selector set to 4,000' & armed.						47			05	5	3	2	
2544a.	Vertical speed selector - set to 1,000 fpm down.						50			03	6	3	2	
2545a.	Flaps 22, speed 188 - called for by Captain.						53			03	5	3	2	
2546a.	Flap handle - place to position 22 (F.O.).						56			03	5	3	2	
2547a.	Flap handle position inds. - move to position 22.						58			02	5	3	2	
2548a.	Flap tapes - move to position 22.					44	03			05	5	3	3	
2549a.	VOR NAV radio 1 - tuned to 109.7						08			05	5	3	2	
2550a.	Altitude alert light - on (passing 4,750').					44	05			--	-	-	-	
2551a.	Altitude alert light - off (passing 4,250').						20			05	5	2	2	
2552a.	Altitude capture mode - engages.						21			01	6	2	2	
2553a.	NAV mode selector - press (Capt).						24			03	6	2	2	
2554a.	Altitude hold mode - engages.						25			01	5	2	2	
2555a.	#2 ADF/VOR selectors - set to ADF.						30			05	5	3	2	
2556a.	Bearing to ROAMY - nearing 140° (approach course).						31			01	5	2	2	
2557a.	Course indicator - shows: hdg 095°, ILS crs 140° & course bar moving.						33			02	5	2	2	
2558a.	Request for F.O. to announce passing SEXXY - Captain.						36			03	6	3	2	
2559a.	Response - at 14 DME (F.O.).						38			02	5	3	2	
2560a.	Localizer capture mode - engages.						40			02	6	2	2	

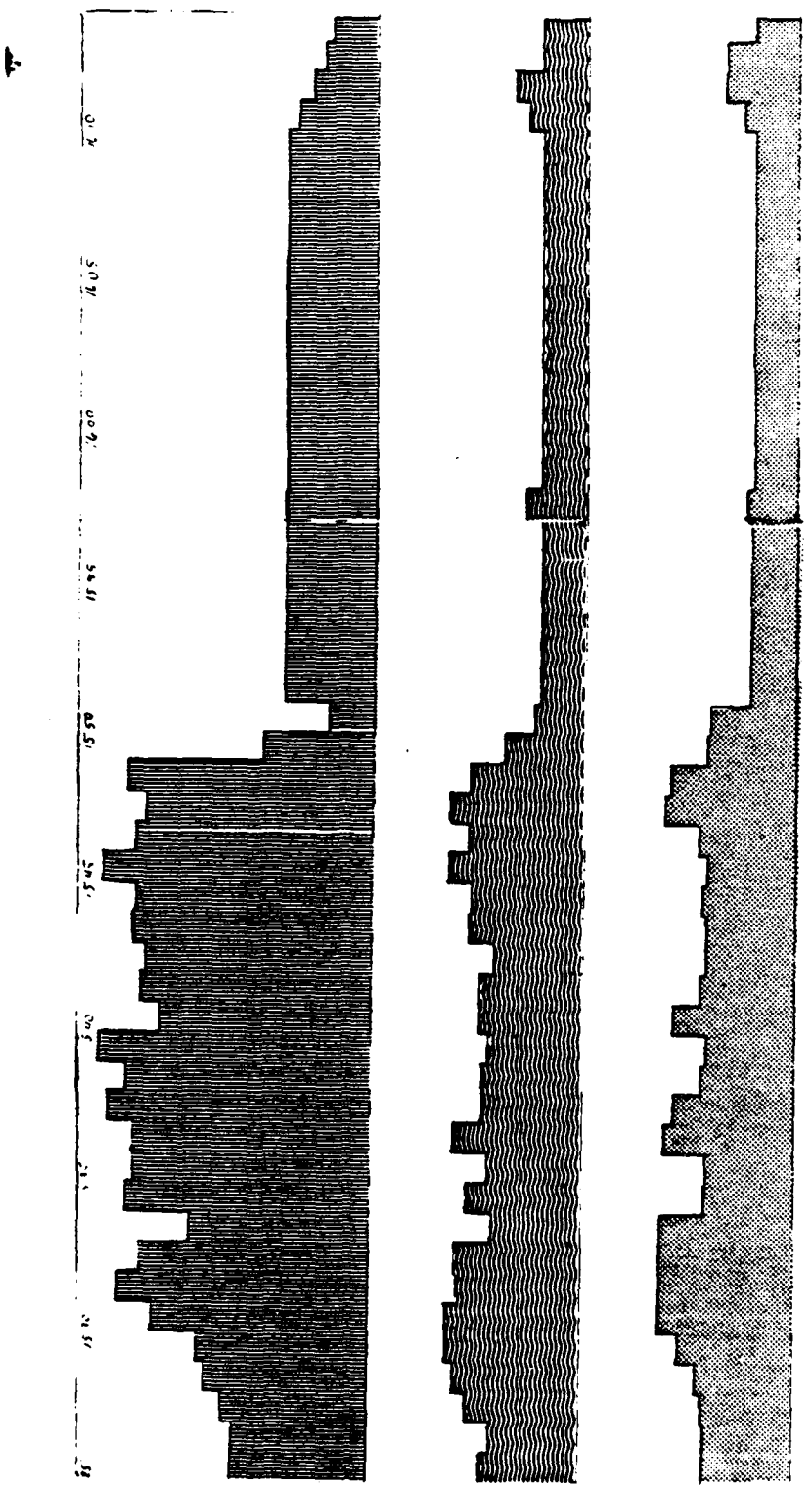
	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2561a.	Announcement - passing SEXXY (F.O.).	15	44	40	15	44	44			04	4	3	2	
2562a.	Vertical speed selector - 1,000 fpm down.						46			02	5	3	2	
2563a.	Request - set and arm 2400' Capt).						48			02	6	3	2	
2564a.	Response - Roger (F.O.).						50			02	4	3	2	
2565a.	Altitude selector - set to 2,400 and pulled out.						52			02	5	3	2	
2566a.	Radio altimeter - shows 2,500' AGL (3167' approx).					45	57		01	05	6	3	2	
2567a.	Decision height lights - on.						58			01	6	3	2	
2568a.	Localizer track mode - engages.					46	04			06	5	2	2	
2569a.	Altitude alert light - on (passing 3150').						05			01	5	2	2	
2570a.	Altitude alert light - off (passing 2650'), altitude cap engaged.						13			08	5	2	2	
2571a.	Altitude hold mode - engages at 2400'.						20			07	5	2	2	
2572a.	Glide slope pointer - nearing center.						21			01	5	2	2	
2573a.	VHF comm 1 - tuned to 118.1 (tower).						24			03	5	3	2	
2574a.	Landing flaps (35) & speed 180 kts - called for by Captain.						27			03	6	3	2	
2575a.	Command acknowledged - First Officer.						29			02	5	3	2	
2576a.	Flap handle - placed to position 35.						32			03	5	3	2	
2577a.	Flap tapes - confirm flaps at position 35 (slat disagree light on).						35			03	5	3	3	
2578a.	Speed selector - set to 180 (35 flap threshold + gust correction).						36			01	5	3	2	
2579a.	Glide slope capture mode - engages.						37			01	6	3	2	
2580a.	Approach only - annunciated.						38			01	5	2	2	
2581a.	Glide slope track mode - engages.						39			01	6	2	2	
2582a.	ADF needle - swings to tail passing ROAMY.						40			01	5	2	2	
2583a.	Maker beacon light and tone - on.						41			01	5	2	2	
2584a.	Final approach fix and target speed 180 knots - Captain's call.						44			03	6	3	2	
2585a.	Altitude - passing 2385, S.O. checks glide slope height.						45			01	5	2	3	
2586a.	Flight instruments and radios monitored - Second Officer.						46			01	5	2	3	
2587a.	Tower contact for landing clearance - First Officer.						47			01	5	3	2	
2588a.	Clear to land on 14 right - Chicago,						49			02	6	3	2	
2589a.	- wind 150° 15 knots, gusts to 22.						51			02	6	3	2	
2590a.	Clearance acknowledged - First Officer.						53			02	5	3	2	
2591a.	VOR # 2 - tuned to 109.7.						55			02	5	3	2	
2592a.	Altitude - passing 1,000' AGL.						56			01	6	3	3	
2593a.	Announcement - 1,000', instruments cross checked (F.O.).						58			02	5	3	3	
2594a.	Announcement going to 867' minimums - Captain.					47	01			03	5	3	3	
2595a.	Altitude - 500' AGL (announcement by F.O.).						34			33	5	3	3	
2596a.	Response final flap setting 35 - Captain.						39			05	5	3	3	
2597a.	Altitude 967' - Second Officer calls approaching minimums.						58			19	5	3	3	
2598a.	Altitude 867' - " " " minimums.					48	05			07	5	2	3	
2599a.	Radio altitude - 50'.						31			26	6	3	3	

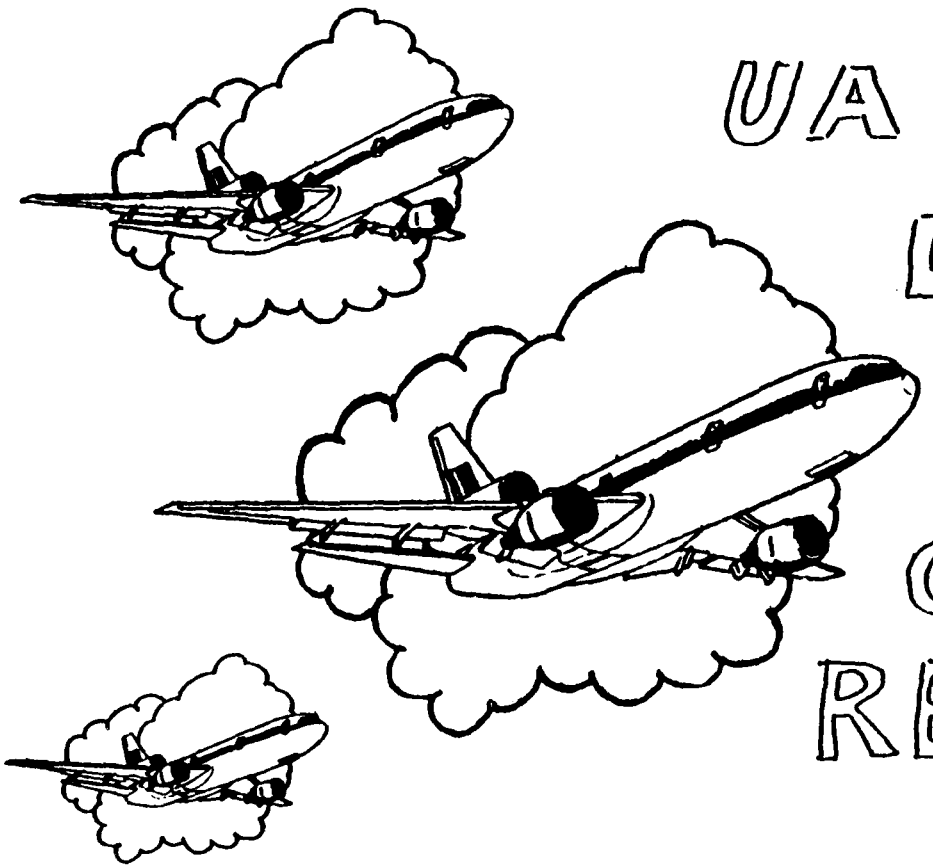
	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2600a.	Announcement - 50' (S.O.).	15	48	31	15	48	33			02	6	3	3	
2601a.	Announcement - 35'						35			02	6	3	3	
2602a.	Announcement - 10'						38			03	6	3	3	
2603a.	Touchdown.						39			01	6	2	2	
2604a.	Throttles - closed (Capt).						40			02	6	2	2	
2605a.	Ground shift (nose strut compression) - Captain lets nose down:						45			05	6	2	2	
2606a.	Throttles - ground idle.						45			--	-	-	-	
2607a.	Outflow valve - open.						45			--	-	-	-	
2608a.	#2 throttle reverse interlock - released.						45			--	-	-	-	
2609a.	Pitot heat - reduced.						45			--	-	-	-	
2610a.	On time - transmitted (ACARS).						45			--	-	-	-	
2611a.	Landing gear handle - latched down.						45			--	-	-	-	
2612a.	Wing anti ice system - deactivates (turns off if on).						45			--	-	-	-	
2613a.	Throttles - lift to reverse range						47			02	5	2	2	
2614a.	Spoilers - extend (#2 throttle in reverse).						48			01	4	2	2	
2615a.	Brakes - on (one application only, accumulator pressure).						51			03	4	2	2	
2616a.	Reverse indicator lights - unlock on then off.						52			01	4	2	3	
2617a.	Reverse thrust light - on.						53			01	4	2	3	
2618a.	Engine indications in limits as reverse thrust applied - Captain/S.O.					49	22			29	4	2	3	
2619a.	Throttles - return to forward thrust.						25			03	4	2	3	
2620a.	Reverse unlock lights - on then off.						26			01	4	2	3	
2621a.	Reverse thrust lights - off.						27			01	4	2	3	
2622a.	Flight director switches - off						28			01	2	2	1	
2623a.	Clearance to ground control and to hold position on runway - Tower.						31			03	2	2	1	
2624a.	Anti skid fail lights - on. (anti skid system was off for landing).						32			01	1	1	1	
2625a.	Spoiler handle - pushed down (Capt).						33			01	2	1	1	
2626a.	Spoiler handle - moves to retract position.						34			01	1	1	1	
2627a.	Spoiler tapes - move to retract.						35			01	2	1	1	
2628a.	Flaps retract - called for by Captain.						36			01	2	2	1	
2629a.	Flap handle - up.						37			01	1	2	1	
2630a.	Flap tapes - move to zero (slat disagree light on).						40			03	1	2	1	
2631a.	ACARS VOX mode select (S.O.).						43			03	1	1	2	
2632a.	Chicago ramp - contacted (on ground, need tow).						45			02	1	1	2	
2633a.	Response - tow vehicle on way, will tow to E11W.						48			03	1	1	2	
2634a.	ACARS DATA mode - selected.						50			02	1	1	2	
2635a.	VHF comm 1 radio - tuned to 121.9 Ground freq.						55			05	1	2	1	
2636a.	Chicago ground - contacted (F.O.).						58			03	1	2	1	
2637a.	Request if engines can be shut down - Chicago ground.					50	03			05	1	2	1	
2638a.	Response - affirmative as soon as APU is running.						06			03	1	2	1	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2639a.	Brake pressure - low, brakes set.	15	50	06	15	50	08			02	2	2	2	
2640a.	APU oil quantity - above 4 qts. minimum.						10			02	1	1	2	
2641a.	APU master switch - run position.						12			02	1	1	2	
2642a.	APU door open light - on.						32			20	1	1	2	
2643a.	Master switch - momentarily to start then run.						34			02	1	1	2	
2644a.	APU oil pressure low light and generator off light - on.						35			01	1	1	2	
2645a.	APU N1, N2 & EGT inds. increase to operating ranges.						52			17	1	1	2	
2646a.	Oil pressure low light - off passing 50% N2.						53			01	1	1	2	
2647a.	Generator off light - off.						57			03	1	1	2	
2648a.	APU power available light - on.					51	00			03	1	1	2	
2649a.	APU bus switches 1, 2 & 3 - on						01			01	1	1	2	
2650a.	Galley power and coffee bar switches - off.						04			03	1	1	2	
2651a.	Cabin outflow valve - check full open.						07			03	1	1	2	
2652a.	Cabin vertical speed and cabin altimeter - open/667'						09			02	1	1	2	
2653a.	Log book entries - Second Officer.						17			08	1	1	2	
2654a.	HF radio switches - off.						18			01	1	2	1	
2655a.	Windshield anti ice and defog sws - off.						19			01	1	2	1	
2656a.	Pitot heat selector - off.						20			01	1	2	1	
2657a.	Engine anti ice sws - off.						21			01	1	2	1	
2658a.	DME sws - standby.						24			03	2	2	1	
2659a.	Radar - stand by.						26			02	1	2	1	
2660a.	Transponder - stand by.						29			03	1	2	1	
2661a.	Rudder stand by power - off.						32			03	1	1	2	
2662a.	Hydraulic motor pumps - check off.						42			10	1	1	2	
2663a.	Request if ready to shut down engines - Captain						44			02	2	1	2	
2664a.	Max temp in reverse - less than 750°.						45			01	1	1	2	
2665a.	Out of reverse - one minute min.						46			01	1	1	2	
2666a.	APU bus sws - on.						48			02	1	1	2	
2667a.	Response - ready to shut down engines (S.O.).						50			02	2	1	2	
2668a.	Captain - orders shut down engines.						52			02	2	2	1	
2669a.	Fuel levers - off.						57			05	1	2	1	
2670a.	Tow vehicle - arrives and hooks up.					56	57		05	00	2	1	1	
2671a.	Brakes off - requested by tow vehicle.					57	00			03	2	1	1	
2672a.	Captain's response - brakes off.						02			02	2	1	1	
2673a.	Request for clearance to gate - First Officer.						05			03	2	2	1	
2674a.	Park brakes - release (Capt).						07			02	2	1	1	
2675a.	Clearance to cross outer taxi way to gate E 11 W - Chicago ground.						10			03	2	2	1	
2676a.	Clearance acknowledged - First Officer.						12			02	2	2	1	
2677a.	Engine bleed sws - off (S.O.).						14			02	2	1	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
2678a.	APU isolation valve switch - open.	15	57	14	15	57	16			02	2	1	2	
2679a.	1-3 & 1-2 isolation valve disagree lights - on then off.						19			03	2	1	2	
2680a.	Gate arrival, brakes on - maintenance.				16	10	19		13	00	2	1	1	
2681a.	Captain's response - brakes set.						21			03	2	1	1	
2682a.	Brake pedals - depress and hold.						23			02	2	1	1	
2683a.	Park brake lever - pull aft.						24			01	2	1	1	
2684a.	Park brake indicator lights - on.						25			01	2	1	1	
2685a.	Brake pedals - release.						26			01	2	1	1	
2686a.	Seat belt sign switch - off.						28			02	1	2	1	
2687a.	INS way point change switches - press.						30			02	2	2	1	
2688a.	Way points 1 & 9 - key in.						32			02	2	2	1	
2689a.	Data selectors - dis/time.						36			04	2	2	1	
2690a.	Displays - show #1, 2nm & #2 1nm.						38			02	2	2	1	
2691a.	Data selectors - XTK/TKE, errors within limits.						40			02	2	2	1	
2692a.	INS 1 & 2 mode selectors - off.						45			05	2	2	1	
2693a.	Emergency light switch - off.						47			02	2	1	1	
2694a.	Fuel tank pump switches - off, except one in tank 2 for APU.						49			02	1	1	2	
2695a.	Cabin door lights - check on.						51			02	1	1	2	
2696a.	ACARS data mode - selected.						53			02	1	1	2	
2697a.	Fuel landing key - press.						56			03	1	1	2	
2698a.	Fuel/Indg key light - on.						57			01	1	1	2	
2699a.	Display - shows FO (fuel on board).						58			01	1	1	2	
2700a.	Key in 242 (24,200#).					11	00			02	1	1	2	
2701a.	Display - shows 242.						01			01	1	2		
2702a.	Enter key - press.						02			01	1	1	2	
2703a.	Display - shows LA (pilot at controls for landing).						03			01	1	1	2	
2704a.	Key in 1 (Captain) - display shows 1.						04			01	1	1	2	
2705a.	Enter key - press.						05			01	1	1	2	
2706a.	Fuel/Indg key light - out.						06			01	1	1	2	
2707a.	Send key - press.						07			01	1	1	2	
2708a.	Parking checklist: parking brake - set (F.O.,C.).						09			02	2	2	1	
2709a.	Radar - off (F.O.,C.).						11			02	2	2	1	
2710a.	Transponder - standby (F.O.,C.).						13			02	2	2	1	
2711a.	Spoilers & flaps - retracted (F.O.,C.).						15			02	2	2	1	
2712a.	Fuel levers - off (F.O.,C.).						17			02	2	2	1	
2713a.	Emergency light switch - off (F.O.,C.).						19			02	2	2	1	
2714a.	Ignition - off (F.O.,C.).						21			02	2	2	1	
2715a.	HF radios - off (F.O.,C.).						23			02	2	2	1	
2716a.	INS - off.						25			02	2	2	1	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
2717a.	Pitot heat - off (F.O.,C.).	16	11	25	16	11	27			02	2	2	1	
2718a.	Motor pumps & aux pumps - Off (F.O.,S.O.).						29			02	1	2	2	
2719a.	Rudder standby power - off.						31			02	1	2	2	
2720a.	Air conditioning - checked.						33			02	1	2	2	
2721a.	Tank pumps - off except on for the APU.						35			02	1	2	2	
2722a.	Cabin door annunciators - all on.						37			02	1	2	2	
2723a.	Windshield anti ice/defog - off.						39			02	2	2	1	
2724a.	Battery switch - onn APU running.						41			02	1	2	2	
2725a.	Cockpit and exterior lights - off.						44			03	2	2	2	
2726a.	External power available light - on.						46			02	1	1	2	
2727a.	External power switch - *on*.						48			02	1	1	2	
2728a.	APU isolation valve switch - close.						50			02	1	1	2	
2829a.	APU generator bus switches - off.						55			05	1	1	2	
2830a.	APU power in uselights - out.						56			01	1	1	2	
2831a.	AC bus tie isolate lights - off.						56			--	-	-	-	
2832a.	APU master switch - off.						58			02	1	1	2	
2833a.	Yellow capped circuit breakers - pull out.					12	13			15	1	1	2	
2834a.	Log book entries - completed.						35			22	1	1	2	
2835a.	Log book - signed.						45			10	2	1	1	
2836a.	Crew departs airplane.				16	13	45		01	00	1	1	1	





UA FLIGHT 280
DEN - ORD
15 JULY '82
COCKPIT DATA REQUIREMENTS

ANNEX B

EFFECT OF ENGINE FAILURE DUE TO FIRE

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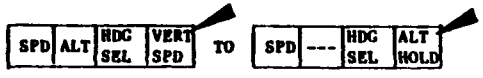
APPROACH DESCENT	95A
FINAL APPROACH AND LANDING	95C
TAXI IN AND PARK	95L
DATA LIST AND ACTION LEVEL	170A
FLIGHT PROFILE AND TASK ANALYSIS	182A

DATA	SOURCE	USAGE
ENGINE LOSS DUE TO FIRE EFFECT APPROACH DESCENT CON'T		
Radar vectors for approach:		
	CHICAGO APPROACH: "United two eighty steer left to 140°."	
	F.O.: "Roger, United two eighty steering left to 140°."	
Heading selector - 140	SOP - F.O.	Autopilot turns the airplane to 140°. (It is not necessary to pull out the selector knob in this case as the system is already in the HDG SEL mode.)
#3 engine fire warning bell sounds	Fire warning system	Alert crew to fire condition.
#3 fire control lever - lighted.	" " "	" " " " "
#3 fuel lever handle - lighted.	" " "	" " " " "
#3 loop A & B lights - on.	" " "	" " " " "
	S.O.: "Captain #3 engine!"	
#3 throttle - closed	Captain	Shut down engine.
#3 fuel lever - off	Captain	Shut down engine.
#3 fire control handle - down	Captain	Shut off fuel & hydraulic fluid to engine.
Fire bell - silenced	Fire handle	Reduce confusion caused by noise.
Fire control handle - full forward and rotated	Captain	Discharge fire extinguisher.
Engine fire checklist:		
	CAPT: "Matt get out the fire checklist."	
	S.O.: "Roger, coming right up."	
Turn over airplane to First Officer	Captain	F.O. will fly as Captain works with S.O. on the checklist.
	CAPT: "Mike you have the airplane, fly the vectors and start configuring for approach."	
	F.O.: "Roger I have it."	
Airplane rudder trim - adjust	First Officer	Trim out assymetrical thrust effect.

DATA	SOURCE	USAGE
ENGINE LOSS DUE TO FIRE EFFECT		
APPROACH DESCENT CON'T		
Handbook - opened to fire procedure.	Second Officer	To read the procedure. Captain will respond.
Checklist:		
#3 throttle - idle	S.O./Captain	Confirm action completed.
#3 fuel lever - off	"	" " "
#3 fire handle - down	"	" " "
#3 handle - full forward & rotate	"	" " "
Fire warning light - out		Confirms fire extinguished.
S.O.: "Captain the light is out we should not need the second bottle."		
CAPT: "Roger, continue with the reference items."		
#3 fuel pump switches - off	Second Officer	Stop fuel pressure.
#3 pack and bleed switches - off	" "	Engine shut down procedures.
1-3 isolation valve switch - closed	" "	Prevent pneumatic air from entering #3 system.
1-3 hydraulic motor pump switch - on	" "	Keep #3 system operating from #1.
35 flap landing - planned	*Captain/S.O.*	Improve go around performance with an engine out.
Engine out landing & go around procedures - review.	Captain/S.O.	Planning for possibility of missed approach.
CAPT: "Matt get out the 2 engine landing and go aroun checklists."		
S.O.: "Roger, will do."		
Airplane control - taken over by Captain:		
CAPT: "Mike, I have the airplane, tell approach control what our problem is and ask for preferential handling."		
"Matt give the company a call with our situation, advise them how many people we have on board, how much fuel, where the wheel chair passengers are located and ask for the emergency equipment to stand by. Landing roll should be normal."		
S.O.: "O.K."		
ACARS VOX mode - selected	Second Officer	Obtain contact with dispatch
ARINC - contacted	" "	" " " "
S.O.: "ARINC, United two eighty, go ahead."		
ARINC: "United two eighty, Chicago, over."		

DATA	SOURCE	USAGE
ENGINE LOSS DUE TO FIRE EFFECT		
APPROACH DESCENT CON'T		
	S.O.: "Chicago, can you patch me through to dispatch?"	
	ARINC: "Roger, stand by."	
FINAL APPROACH AND LANDING		
Left turn to 190° - radar vector	Approach control	Traffic control
	APPROACH CONT: "United two eighty, turn right now to 190°."	
	F.O.: "Roger Chicago, right to 190°. Be advised we have an engine shut down and would like to be handled as expeditiously as possible."	
	APPROACH CONT: "Understand, you will be turning base very shortly."	
Heading selector - set to 190°	First Officer	follow vectors. Auto pilot steers the airplane.
VOR 1 - tuned to 109.7 Chicago 14R ILS	Approach plate (freq) - Captain	Prepare for ILS approach.
Course sel - set to 140°	" " "	Set ILS final approach course.
	CAPT: "Mike, I'm on the ILS frequency and I'd like you to tune ORD so we'll have DME until passing ROAMY."	
	F.O.: "Roger."	
VOR 2 - tuned to 113.9 ORD VOR	Approach plate - F.O.	DME information to identify SEXXY & ROAMY.
Dispatch - contact		
	DISPATCH: "United two eighty, dispatch, go ahead."	
	S.O.: "Dispatch, two eighty has an engine shut down. We are approaching Chicago and should be on the ground in about ten minutes. There are 20 passengers in first, 151 in the rear. The two wheel chair passengers are located on the aisle - row 9 B and 18 B. We will have approximately 24,000# of fuel and would like the emergency equipment standing by."	
	DISPATCH: "Understand, equipment will be on the way. standing by."	
VOR 2 - monitored	First Officer	Identify proper station tuned.

DATA	SOURCE	USAGE
ENGINE LOSS DUE TO FIRE EFFECT		
FINAL APPROACH AND LANDING CON'T		
2 engine landing and go around checklists:		
Turn over airplane to First Officer	Captain	Free Captain to review the checklist.
CAPT: "Mike, you have the airplane while I review the procedures. Better get the flaps out to 15 and start to slow up."		
F.O.: "Roger, I have it."		
Loss of second engine considerations	Checklist - Capt & S.O.	Pre plan actions if second engine should fail.
Flaps - zero extend	"	Permit acceleration.
Accelerate to 163 knots	"	Improve performance.
GPWS - inhibit	"	Prevent unwanted signal.
2 engine approach	"	Planning.
Normal except 35 flaps	"	Performance in the event of missed approach.
Trim centered prior to landing	"	Directional control.
2 engine go around	"	Planning.
Go around flap setting - 22 (15 at higher temps)	"	Performance.
Gear up - at positive rate.	"	Positive rate assures no touch down without gear.
Climb at target approach speed or use GA mode.	"	Performance.
Speed brake handle - check in detent	First Officer	Prevent extending flaps with speed brake deployed.
Flap/slat handle - set to position 15	" "	Extend flaps and slats to permit slower speed
Flap handle position pointers - 15	" "	Assure correct selection.
Flap indicator tapes - 15	" "	Assure flaps extended.
Speed selector - 163 knots (15 flap speed)	Landing data card - F.O.	Throttles will slow to and maintain speed.
Throttles - adjust.		
Captain takes over airplane control		
CAPT: "Thanks Mike I have the airplane."		
F.O.: "Roger, flaps are 15 and speed 163. we are still on the 195° vector."		
Engine ignition selector - continuous B	Second Officer	Provide ignition for approach.

DATA	SOURCE	USAGE
ENGINE LOSS DUE TO FIRE EFFECT		
FINAL APPROACH AND LANDING CON'T		
RADAR vector/descent clearance:		
CHICAGO APPROACH: "United two eighty turn right to 250° and descend to 5,000', this is your base leg."		
F.O.: "Roger, United two eighty steering right to 250° for base leg and descending to 5,000'."		
Altitude selector - 5,000 set & arm	SOP - First Officer	Set FGS to capture and hold 5,000"
Vertical speed selector - 1,000 FPM down	SOP - Capt	Auto pilot will descend the airplane while the auto throttles maintain 163 knots.
Altitude 5,000' - alert light, capture and hold as before.		Auto pilot levels at the selected altitude.
Maneuvering flaps:		
CAPT: "Flaps - 22, speed 153."		
F.O.: "Roger flaps 22, speed 153."		
Flap handle - position 22	Flap indicator - F.O.	Extend flaps to reduce maneuvering safe speed.
Flap indicator tapes - 22	Flap indicator - F.O.	Verify flaps moved to selected position.
Speed selector - 153	Landing data card - Capt - F.O.	Throttles will further slow the airplane.
RADAR vector to intercept heading:		
CHICAGO APPROACH: "United two eighty, turn left to 170°. This is your intercept heading, you are cleared for ILS approach to 14 right. Cross SEXXY intercection at 4,000', contact the tower on 118.1 over ROAMY."		
F.O.: "Roger two eighty turning to 170°, cleared for approach, cross SEXXY at 4,000, tower on 118.1 at ROAMY."		

DATA	SOURCE	USAGE
ENGINE LOSS DUE TO FIRE EFFECT **FINAL DESCENT AND LANDING CON'T**		
Heading selector - 170	RADAR vector - F.O.	Auto pilot will turn the airplane to 170°.
Altitude selector - 4000 set and arm	Approach control - F.O.	Set FGS to capture and hold 4,000'.
Vertical speed selector - 1,000 FPM down	SOP - Capt	Auto pilot will descend the airplane at 1,000 FPM.
Altitude alert light - on	Automatic - Alt alert system	Alerts pilots as airplane nears level off altitude.
Altitude 4,000' - Alt captured and held	Automatic - FGS	Auto pilot levels off and changes to alt hold mode.
ILS mode selector - press	SOP - Capt	To arm the flight guidance system to capture and track both the localizer and the glide slope.



Landing configuration:

CAPT: "Gear down, final descent checklist."

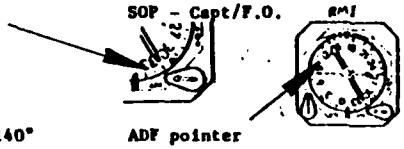
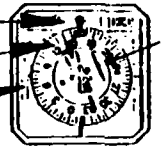
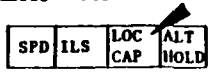
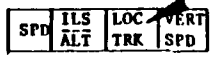
F.O.: "Roger, gear down."

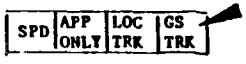
Gear handle - down	Capt - F.O.	Extends the gear.
Gear indicator lights - 3 green	Gear indicators	Verifies the gear is locked in the down position.
Brake pressure - normal	Brake press gages - F.O.	Verifies brake availability.
Spoiler handle - raise	SOP - F.O.	Arms spoilers for automatic deployment on touch down.
Final descent checklist	Cockpit card	Read by Second Officer - responded to by appropriate crew member. Verify safety items complete.

FINAL DESCENT CHECKLIST

CHALLENGE (S/O)		RESPONSE
IGNITION	-	CONTINUOUS (F/O)
FLIGHT & NAV INSTRUMENTS	-	CROSS CHECKED NO FLAGS (F/O)
GEAR	-	DOWN, THREE GREEN (F/O)
FLAPS	-	22, TAKEOFF LIGHT (F/O)
BRAKE PRESSURE	-	NORMAL (F/O)
SPOILERS	-	ARMED (F/O)
ANNUNCIATOR LIGHTS	-	CHECKED (F/O,S/O)

S.O.: "Checklist complete."

DATA	SOURCE	USAGE
ENGINE LOSS DUE TO FIRE EFFECT, FINAL APPROACH AND LANDING CON'T		
ILS approach:		
#2 ADF/VOR selectors - ADF	SOP - Capt/F.O. 	Verify passage of ROAMY locator, and compare bearing with ILS course.
Bearing to ROAMY - nearing 140°	ADF pointer	Indicates nearing approach course.
Course indicator shows: Heading - 170° ILS course - 140° Course bar - moving in 		Indicates nearing approach course.
	CAPT: "The course bar is off the peg. Let me know when we pass SEXXY."	
	F.O.: "Right, that'll be 14 miles on the DME."	
Localizer capture mode - engages	Automatic - FGS 	Auto pilot turns the airplane to intercept and track the localizer.
14 miles from ORD (SEXXY int.)	DME tuned to ORD - F.O.	Identify position.
Vertical speed wheel - 1,000 FPM down	SOP - Capt	Initiate descent to approach altitude.
	CAPT: "Set and arm 2400'."	
	F.O.: "Roger 2400'"	
Altitude selector - 2400' & pull out	Capt - F.O. (altitude from the approach plate) 	Arms FGS so that auto pilot will capture the selected altitude. Auto throttle will continue to hold the selected 22 flap speed (153)
Radio altitude - passing below 2,500'	Radio altimeter	Alerts crew to flight situation.
Decision height lights on	Capt & F.O.	Press to extinguish and rearm.
Localizer track mode - engages	Automatic - FGS (cannot engage in track until below 2,500' radio altitude) 	Auto pilot will track the localizer to the runway.

DATA	SOURCE	USAGE
FINAL APPROACH AND LANDING CON'T		
Altitude - 2,400'	Altimeter - Flight guidance system 	Automatic capture of the selected altitude.
Glide slope pointer - nearing center	Course indicator - Capt & F.O. 	Indicates that flight is approaching the glide slope.
VHF comm 1 - tune to 118.1 (ORD tower)	Chicago approach/approach plate - F.O.	Prepare for tower contact at ROAMY.
Landing flap setting - 35	SOP - Capt & F.O.	Slow to approach speed and set landing configuration.
Target approach speed - set (Threshold speed plus 1/2 the steady wind velocity and the full gust factor, not to exceed 15 knots. [15 gusts to 22] 133 + 8 + 7 = 148 knots)	SOP/flight handbook/landing data card - Capt & F.O.	Set minimum safe speed for wind and weight conditions.
	CAPT: "Flaps - 35, speed 148. I have the runway in sight, but will continue on auto pilot."	
	F.O.: "Roger, 35, speed 148."	
Flap handle - position 35	F.O.	Select landing flaps.
Flap tapes - 35, Slat land lt - on	Flap indicator - F.O.	Verify flaps & slats have moved to selected position.
Speed selector - 148	F.O.	Set auto throttle system to maintain target approach speed.
Glide slope capture mode - engages and approach only annunciates.	Flight guidance system 	Auto pilot maneuvers to capture the glide slope and track it to the runway. Approach only is a reminder that the auto land is not armed and a manual landing must be made.
Glide slope track mode - engages	Flight guidance system 	Auto pilot will now keep the airplane on the glide slope, while the auto throttle maintains target approach speed.

DATA	SOURCE	USAGE
LOSS OF ENGINE DUE TO FIRE EFFECT		
FINAL APPROACH AND LANDING		
Autopilot disconnect button - press	Captain	Prepare to make approach.
Autopilot disengage lights - flashing	Warning system	Alert crew whenever autopilot disengages.
Autopilot disconnect button - press again	Captain	Puts out the warning light
Autopilot disengage lights - out	Captain	Re arms for subsequent alert.
Auto throttle disconnect buttons - press	Captain	Prepare for approach.
Auto throttle disengage lights - flashing	Warning system	Alert crew whenever both auto throttles go off.
Auto throttle disconnect buttons - press	Captain	Puts out the warning light.
Auto throttle disengage lights - off		rearmed.
Crossing ROAMY:		
ADF needles - swing to tail.	RMI/ADF - F.O.	Indicates station passage.
Marker beacon lights - on	Marker panels	Indicate station passage.
Marker tone sounds	Marker radio.	Indicates station passage

DATA	SOURCE	USAGE
LOSS OF ENGINE DUE TO FIRE EFFECT FINAL APPROACH AND LANDING CON'T		
Final approach fix and target speed - call.	SOP - Capt	Verbal identification of the fix and speed to assure cross check by other crew members, and make sure the command speed bug is set.
	CAPT: "ROAMY - my target approach speed is 148 knots."	
Altitude - 2385'	Altimeter/approach plate - Second Officer	Verification of glide path height at the final approach fix.
Flight instruments and radios - monitor	SOP - S.O.	Verify any discrepancy or evidence of destabilization.
Tower contact - landing clearance	F.O.	Get landing clearance.
	F.O.: "Chicago tower, United two eighty heavy, ROAMY, go ahead."	
	CHICAGO TOWER: "Roger, United two eighty heavy is cleared to land on 14 right. Wind is 150° at 15 knots with gusts to 22."	
	F.O.: "Roger, United two eighty cleared to land."	
#2 VOR - tuned to 109.7	Approach plate - F.O.	Provides a back up ILS indication for the system already in use, and permits the First Officer to monitor the approach.
Altitude - 1000' above grnd level - instrument check and call out and response; announcing the minimums.	SOP - First Officer & Captain & S.O.	Verify that all instruments are in agreement between left and right systems and get a response to make sure no subtle incapacitation of the Captain has occurred.
	F.O.: "1,000', instruments cross check."	
	CAPT: "Going to 867' barometric."	
Altitude - 500' above grnd level - cross check and final flap setting response.	SOP - First Officer & Captain & S.O.	Verify flap setting, planned reference speeds and check against incapacitation.
Altitude - 967' (100' above min) approaching minimums call	SOP - Second Officer	Alert the Captain that he is nearing minimum alt.
Altitude - 867' (minimums) call	SOP - Second Officer	Inform Captain that minimum altitude has been reached.

NOTE: Preceeding two calls might not be required in the event of visual approach conditions.

DATA	SOURCE	USAGE
LOSS OF ENGINE DUE TO FIRE EFFECT FINAL APPROACH AND LANDING CON'T		
Radio altitude 50' - throttles close Rudder trim - centered	Captain Second Officer	Reduce thrust for landing. Directional control.
Altitude call outs just prior to touch down at 50, 30 & 10 feet	Radio altimeter/SOP - S.O.	Assist the Captain in judging flare.
Touchdown:		
Throttles - idle		Throttles
Spoilers - extend	Auto-spoiler system - S.O.	
Ground shift - nose strut compression:	Capt lowers nose wheel to runway	Switches several systems to ground operation.
Throttles - gnd idle	Automatic	Permits lower idle for deceleration.
Outflow valve - open	Automatic/pressure controller	Depressurizes cabin.
#2 throttle revers interlock - release	Automatic	Permits reverse operation of #2 engine.
Pitot heat - reduces	Automatic	Prevents over heat on the ground
On time - transmitted	ACARS	Radios on time to ARINC which passes info to UNIMATIC for flight following, airplane flight time, crew flight time etc.
Landing gear handle - latch	Mechanical linkage	Prevent inadvertent gear retraction.
Wing anti-ice - deactivates (turns off, if on.	Automatic	Prevent over heat of slat anti-ice system.
Throttles - lift to reverse	Capt	Assist in deceleration.
Brakes - apply	Capt	Deceleration.
Reverse indicator lights - Reverse unlock - on/off & reverse thrust light - on	Reverse mechanism position - S.O.	Monitor reverser operation. (S.O. informs Captain of any abnormal indication.
Engine indications - in limits	SOP - S.O.	Prevent over temp or over boost.
Throttles - forward thrust (prior to going below 60 kts)	SOP - Capt	Taxi to ramp.
Reverse indicator lights - reverse unlock - on/off & reverse thrust light - off	SOP - Capt/S.O.	Verify forward thrust.

DATA	SOURCE	USAGE
LOSS OF ENGINE DUE TO FIRE EFFECT		
FINAL APPROACH AND LANDING CON'T		
Flight director switches - off	SOP - Capt & F.O.	Clear the annunciators and turn off the system.

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Clearance to ground control:

CHICAGO TOWER: "United two eighty, clear the runway to the left when able, change to ground control on 121.9."

TAXI IN AND PARK		
Anti skid switch - off	SOP - Capt	Prevents loss of brakes in the event of a faulty ground shift mechanism.
Anti skid fail annunciator lights - on	Annunciator panel - Capt	Verifies that the anti skid system is off.
Spoiler handle - push down	SOP - Capt	To retract the spoilers.
Spoiler handle - moves to retract position	Automatic	Retracts splrs to clear evac route if needed.
Spoiler tapes - zero	Flight control *position indicator* - Capt	Verifies spoilers retracted.
Flaps - retract	Capt - F.O. (on command)	Flaps are retracted to preclude damage from debris which might be thrown up by the wheels. (only to position 22 if snow or slush are present)

CAPT: "Flaps - up."

Flap handle - Up	F.O.	To retract the flaps and slats.
Flap tapes - zero	Flap/slat position indicator - F.O.	Verify flaps have retracted.
Slat indicator lights - disagree then out	Flap/slat position indicator - F.O.	Verify slats have retracted.
HF radio sws - off	SOP - F.O.	Turn off, if on, to reduce operating time.
Windshield anti-ice and de-fog sws - off	SOP - F.O.	Allow to cool.
Pitot heat selector - off	SOP - F.O.	Allow to cool.
Engine anti ice sws - off	SOP - F.O.	Turn system off if on.
DME 1 & 2 - standby	SOP - F.O.	System has no off switch position so DME's are placed in standby which is a warm up mode.
Radar - standby	SOP - F.O.	Same as DME.
Transponder - stand by	SOP - F.O.	Same as DME.

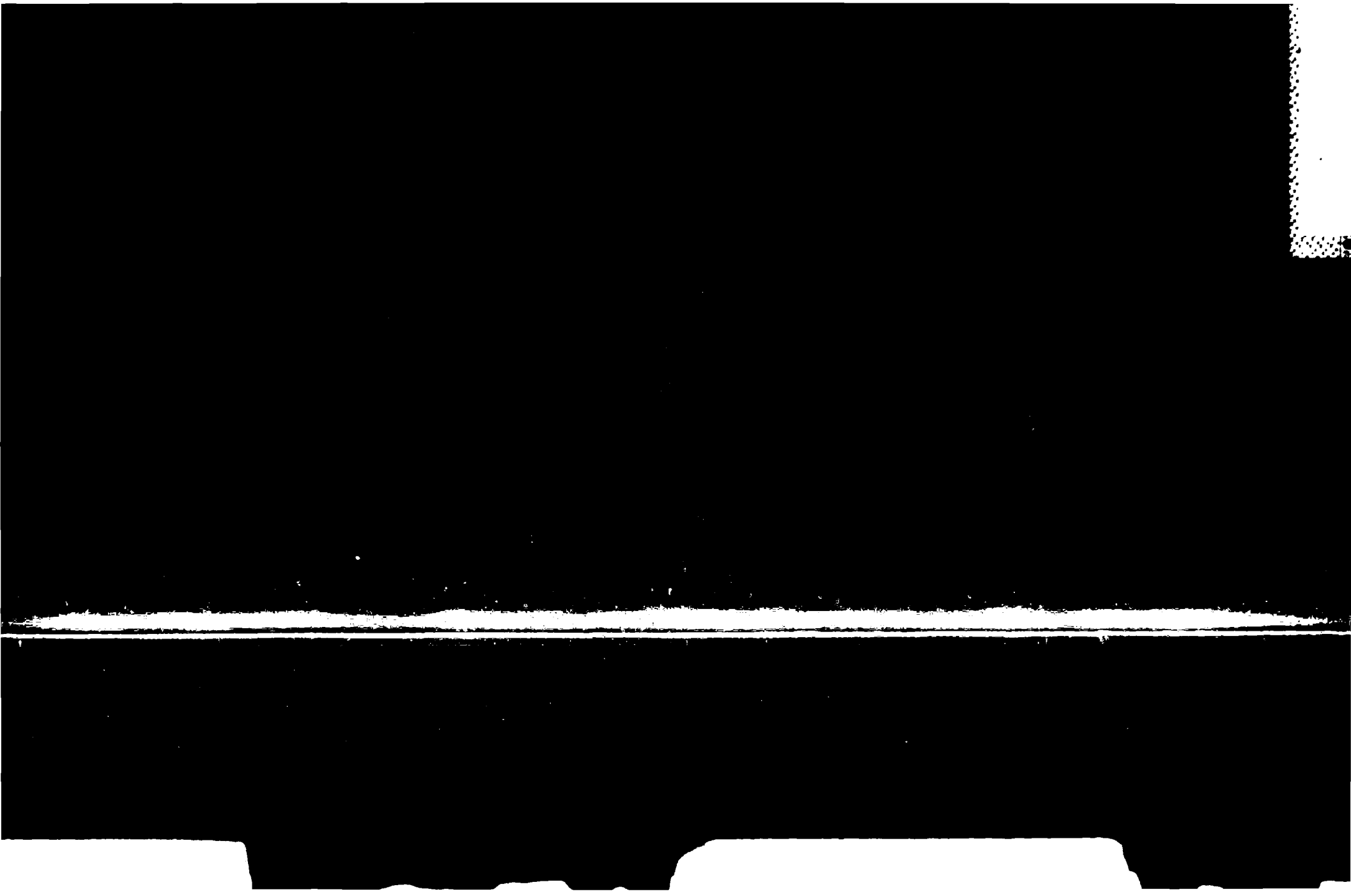
DATA	SOURCE	USAGE
LOSS OF ENGINE DUE TO FIRE EFFECT		
TAXI IN AND PARK CON'T		
Gate confirmation	Chicago ramp - S.O.	Confirm gate position.
ACARS vox mode - select	S.O.	Return VHF com 2 to voice operation.
	S.O.: "Chicago ramp, United two eighty is on the ground requesting confirmation of gate E 11 west."	
	CHICAGO RAMP: "Roger two eighty, gate E 11 west is confirmed, your wheel chairs are waiting."	
	S.O.: "Captain, we have gate E 11 west still."	
ACARS data mode - select	S.O.	Return to data mode for normal operation
VHF com 1 radio - 121.9	Tower/approach page - F.O.	Contact ground control.
	F.O.: "Chicago, United two eighty heavy on 121.9"	
	CHICAGO GROUND: "United two eighty left at the next high speed - hold short of the outer taxiway."	
	F.O.: "Roger Chicago, two eighty will clear left at the next turn off."	
Brake pressure - normal	Sys 1 & 2 brake press gages - F.O. & S.O.	Confirm pressure to assure adequate braking.
APU start:	SOP - S.O.	Prepare to furnish electrical and pneumatic power so engines may be shut sown at the gate.
APU oil quantity - 4 qts min	APU control panel/flight handbook limits - S.O.	4 qts minimum is required for APU operation prior to starting. (Any amount above zero is okay after the APU is running.)
APU master switch - run	SOP - S.O.	Opens APU inlet door.
APU door open light - on	S.O.'s annunciator light panel - S.O.	Verifies that door has opened.
Master switch - Momentarily to run, then release to run	SOP - S.O.	Begins APU starting cycle.
APU oil press lo and generator off lights come on	APU control panel - S.O.	Normal starting cycle indications.
N_1, N_2 & Exhaust temp inds - increase to operating ranges	APU control panel - S.O.	Normal starting and operating indications.
APU oil pressure lo light - off	APU control panel - S.O.	Confirms adequate oil pressure for operation.

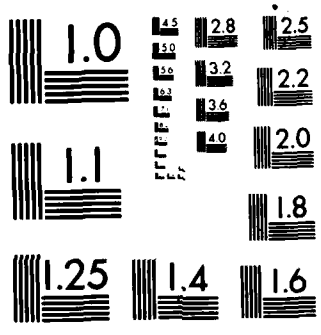
DATA	SOURCE	USAGE
LOSS OF ENGINE DUE TO FIRE EFFECT		
TAXI IN AND PARK CON'T		
APU gen off light - out	APU control panel - S.O.	Confirms generator is operating satisfactorily.
APU power avail lt - on	APU control panel - S.O.	Confirms generator volts and frequncies normal.
APU gen bus sws 1,2 & 3 - on	SOP S.O.	APU generator will now power airplane gen buses automatically as the engines are shut down.
Galley power and coffee bar sws - off	SOP - S.O.	Reduce unnecessary electrical loads, and shut down unnecessary equipment.
Cabin outflow valve - full open	Valve position ind - S.O.	Verifies cabin has depressurized.
Cabin vertical speed - zero and cabin altitude 667' (field elevation)	Cabin press. control panel - S.O.	Verifies cabin has depressurized.
Log book entries	S.O.	Information for maintenance for airplane/engine hist.
Taxi obstruction:	Visual	Causes slowing or stopping.
F.O.	"Captain watch that 727 on the outer taxi way he's blocking our path."	
Brakes - on/throttles closed	Capt	Stopping until obstruction clears.
CHICAGO GROUND	"American four twenty, please pull ahead you are blocking the taxi way."	
AMERICAN 420	"Will do, sorry."	
Rudder standby power - off	Second Officer	Prevents unnecessary operation and wear during engine shut down, caused by changes in engine hydraulic pump pressure changes.
Hydraulic motor-pumps - off	Second Officer	Prevent unnecessary wear during engine shut down.

AD-A140 643 COCKPIT DATA MANAGEMENT REQUIREMENTS (CURRENT TECHNOLOGY AIRCRAFT)(U) ARINC RESEARCH CORP ANNAPOLIS MD T P BERRY OCT 83 1378-03-8-3150 DOT/FAA/PM-83/25 4/4

UNCLASSIFIED DTFA01-80-C-10030 F/G 1/3 NL







MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

DATA	SOURCE	USAGE

TAXI IN AND PARK CON'T

CHICAGO GROUND: "United is clear across the outer."

F.O.: "Two eighty, roger."

Ramp traffic:

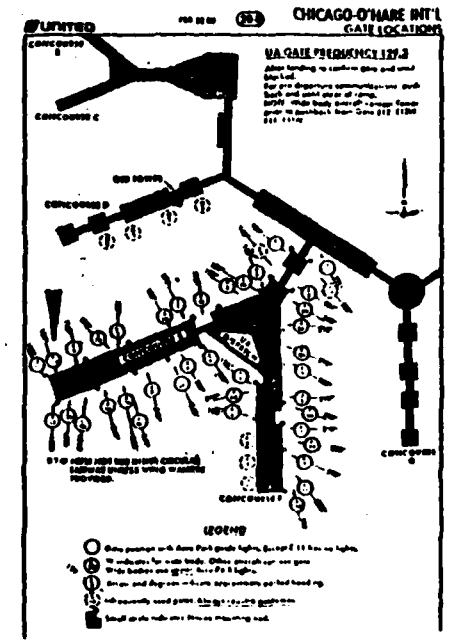
F.O.: "Captain George do you see the truck coming from your left?"

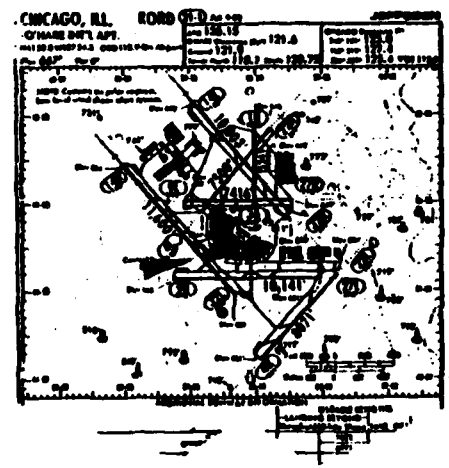
CAPT: "Roger I've got him in sight, he's stopping."

Gate location:

CAPT: "Let me have a look at that gate chart, I think E 11 W is just over to the right as we come on to the ramp here."

F.O.: "Thats correct, and there is someone out there in place."





Turn off point to ramp.

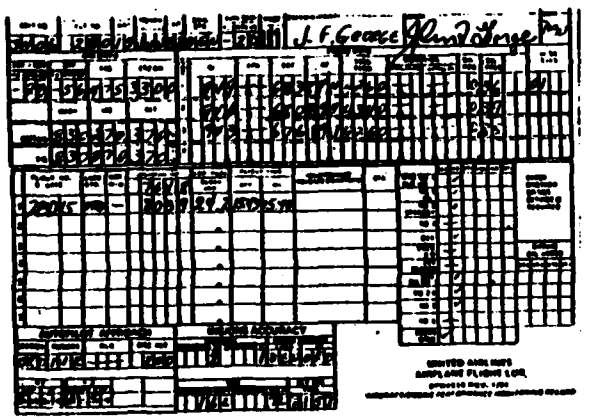
DATA	SOURCE	USAGE
TAXI IN AND PARK CON'T		
Accu-park:		
Red and green neon lead in lights	Visual - Capt	Provide the Captain with a visual reference as he taxies in to the gate so that the airplane will be properly lined up with the gate.
Red neon lights located off to the side	Visual - Capt	Provide the Captain with a visual reference for stopping.
Brake pedals - depress and hold	SOP - Capt	To set the parking brakes.
Parking brake lever - pull aft	SOP - Capt	To set the parking brakes.
Brake pedals - release	SOP - Capt	
Park brake ind lights - on	Annunciator panel & pedestal - Capt	Verify brakes are set.
Seat belt sign - off	SOP - Capt or F.O.	Let passengers prepare to deplane.
Stabilizer trim handles - hold toward nose down until trim ind reaches the top of the green band.	SOP - Capt or F.O.	Position the stabilizer to the park position which prevents possible foreign material from getting in the mechanism.
Engine bleed switches - off	SOP - S.O.	Preparation for shutting down the engines.
INS 1 & 2 waypoint change sws - press	SOP - Capt	Preparation for shutting down the INS.
Waypoints 1 & 9 - key in	SOP - Capt	Preparation for reading distance error for the log.
Data selectors - dis/time	SOP - Capt	Read distance for the log.
Displays show - #1, 2NM & #2, 1NM	SOP - Capt	Compare with limit, must be written up if over 25 NM.
Data selectors - XTK/TKE	SOP - Capt	Read Cross track distance and write up if over 25 NM.
INS 1 & 2 mode selectors - off	SOP - Capt	Turn off the INS equipment.
Engine shut down:	SOP - Capt & S.O.	Preparation for leaving airplane.
	CAPT: "Matt are you ready for engine shut down?"	
	S.O.: "Roger, Captain, they have idled long enough for cooling and I have the APU generator on tap."	
	CAPT: "Okay shut them down."	
Fuel levers 1 & 2 - off	F.O.	Shuts off the engines.
APU 1 & 2 power in use lights - on	S.O.	Confirms that APU generator has powered the electrical system.

DATA	SOURCE	USAGE
TAXI IN AND PARK CON'T		
Emergency light switch - off	SOP - Capt	Disarms the automatic emergency light system to prevent inadvertent discharge of the batteries.
Pack switches - on	SOP - S.O.	Switches checked in the on position to continue air conditioning from the APU pneumatic air.
1-2 & 1-3 isolation valve swe - normal	SOP - S.O.	Valves will operate from the APU isoltion valve switch
APU isolation valve switch - open (after engine shut down to preclude engine fumes entering the cabin air)	SOP - S.O.	Opens the APU isolation valve to allow air from the APU compressor to enter number two pneumatic system and also opens the 1-2 & 1-3 isolation valves so the air can pressurize 1 & 3 systems as well.
Fuel tank pump swe - off except #2 rt aft	SOP - S.O.	One pump in #2 tank is required to operate the APU.
Cabin door lights - check on	SOP - S.O.	Confirms that the escape slides in the doors have been disarmed.
ACARS data mode - select	SOP - S.O.	Prepare to enter fuel and landing data.
Fuel/lndg key - press	SOP - S.O.	Prepare to enter fuel and landing data.
Fuel/lndg key light - on & display shows FO (fuel on board)	Visual - S.O.	Verifies set is ready to accept information.
Key in 242 (24,200#) - display shows 242	Fuel quantity indicators, fuel remaining	Numbers in the window verify correct info has been entered.
Enter key - press	SOP - S.O.	Enters data and clears the display.
Display - shows LA	Visual - S.O.	Indicates ACARS is ready to accept pilot at the controls for landing information.
Key in 1 (Captain) - display shows 1	SOP - S.O.	Verify 1 has been selected.
Enter key - press, fuel/lndg key light - out	SOP - S.O.	Information is now ready to send.
Send key - press.	SOP - S.O.	ACARS transmits in time as well. In time is recorded when the brakes are set and doors 1 or 2 left are opened.

DATA	SOURCE	USAGE
TAXI IN AND PARK CON'T		
Parking checklist	Cockpit card	Read by First Officer - responded to by appropriate crew member.

PARKING CHECKLIST

CHALLENGE (F/O)		RESPONSE
PARKING BRAKE	-	SET (C)
RADAR	-	OFF (C)
TRANSPONDER	-	STANDBY (C)
SPOILERS & FLAPS	-	RETRACTED (C)
FUEL LEVERS	-	OFF (C)
EMERGENCY LIGHT SWITCH	-	OFF (C)
IGNITION	-	OFF (C)
HF RADIOS	-	OFF (C)
INS	-	OFF (C)
PITOT HEAT	-	OFF (C)
MOTOR PUMPS & AUX PUMPS	-	OFF (S/O)
RUDDER STANDBY POWER	-	OFF (S/O)
AIR CONDITIONING	-	CHECKED (S/O)
TANK PUMPS	-	OFF (EXCEPT ONE FOR APU) (S/O)
CABIN DOOR ANNUNC. LIGHTS	-	ALL ON (S/O)
WINDSHIELD ANTI-ICE/DEFOG	-	OFF (C)
BATTERY SWITCH	-	ON (APU RUNNING) (S/O)

DATA	SOURCE	USAGE
TAXI IN AND PARK CON'T		
Cockpit and exterior lights - off	SOP - Capt - F.O. - S.O.	Reduces heat and prolongs life of panels and lights.
APU shut down:		
External power available light - on	Visual - S.O.	Indicates external power is available and acceptable.
External power switch - on	SOP - S.O.	Powers the tie bus, so that the APU can be shut down.
APU isolation valve switch - close	SOP - S.O.	Starts the 90 second enforced idle before the APU will shut down and unloads it pneumatically for cooling.
APU generator bus sws - off	SOP - S.O.	Unloads the APU electrically.
APU power in use lights and the AC bus tie isolate lights - out	Visual - S.O.	Verifies that External power is now powering the buses.
APU master switch - off	SOP - S.O.	Shuts down the APU unless the 90 second timer has not run out. APU will shut down at the end of the time.
Yellow capped circuit breakers - pull	SOP - S.O.	Yellow caps identify breakers that are used to un-power certain equipment such as electronics so they will not stay operating and hot when not needed.
Log book completed		All data recorded and ready for the Captain's signature
Log book signed		
Crew departs the airplane.		

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL			REMARKS
					CAP.	F.O.	S.O.	
2366.	Clearance to reduce to 180 knots - Chicago approach.	15 27 25	15 27 30	05	4	3	2	
2367.	Speed reduction - acknowledge (F.O.).		32	02	3	3	2	
2368.	Captain requests speed selector - set to 180 &		34	02	4	3	2	
2369.	- slats extended.		36	02	4	3	2	
2370.	Speed selector - set to 180 (F.O.).		38	02	3	3	2	
2371.	Throttles - adjust to slow to 180 knots.		41	03	3	2	2	
2372.	Flap/slat handle - moved to zero/extend.		44	03	3	3	2	
2373.	Slat disagree light - on.		47	03	3	3	2	
2374.	Slat take off light - on & disagree light off.		49	02	3	2	2	
2375.	Landing gear warning lights - red.		50	01	3	2	2	
2376.	Airspeed - reducing below 215 knots.		28 00	10	3	2	2	
2377.	Landing gear warning horn - sounding.		05	05	3	2	3	
2378.	Gear horn off button - press (S.O.).		09	04	3	2	3	
2379.	Gear warning horn - silenced.		10	01	3	2	2	
2380.	First Officer - asks if Captain wants gear down.		15	05	4	3	2	
2381.	Response - not yet (gear down uses 1000 fuel per hour).		20	05	4	3	2	
2382	Radio call - Chicago approach.		29 00	40	3	3	2	
2383.	Radio call - acknowledged (F.O.).		05	05	3	3	2	
2384.	Radar vector - turn left to 140°.		10	05	4	3	2	
2385.	Heading change - acknowledged (F.O.).		15	05	3	3	2	
2386.	Heading selector - set to 140°.		20	05	4	2	2	
2387a.	Auto pilot - starts turn toward 140°.		22	02	3	2	2	
2388a.	#3 engine fire warning light and bell - on.		23	01	4	3	3	
2389a.	Captain - advised #3 (S.O.).		25	02	5	3	3	
2390a.	#3 Throttle - close (Capt).		26	01	5	3	3	
2391a.	#1 fuel lever - off (Capt).		29	03	5	3	3	
2392a.	#1 fire handle - down (Capt).		32	03	5	3	3	
2393a.	Fire bell - off.		33	01	4	2	3	
2394a.	Fire handle - hold forward and rotate (Capt).		36	03	5	2	3	
2395a.	Engine fire checklist - ordered by Captain.		38	02	5	2	3	
2396a.	Response - Second Officer.		40	02	5	2	3	
2397a.	First Officer ordered to fly - Captain.		42	02	5	3	3	
2398a.	Response - First Officer.		44	02	4	4	3	
2399a.	Airplane rudder trim - adjust (F.O.).		47	03	4	4	3	
2400a.	Emergency procedures - consult (S.O.).		52	05	4	3	3	
2401a.	Emergency procedures read - Second Officer.		55	03	5	3	3	
2402a.	#3 throttle - response "idle" (Capt).		58	03	5	3	3	
2403a.	#3 fuel lever - response "off" "		30 01	03	5	3	3	
2404a.	#3 fire handle - down - response "down" (Capt).		04	03	5	3	3	
2405a.	#3 fire handle - full forward & rotate.		07	03	5	3	3	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2406a.	Fire warning light - out.	15 30 07	15 30 08	01	4	3	3	
2405a.	"light is out, second extng. not required - Second Officer.		10	02	5	3	3	
2406a.	Checklist reference items ordered - Captain.		11	01	5	3	3	
2407a.	#3 fuel pump switches - off (S.O.).		14	03	4	3	3	
2408a.	#3 bleed and pack switches - off.		17	03	4	3	3	
2409a.	1-3 isolation valve sw - closed.		19	02	4	3	3	
2410a.	1-3 hydraulic motor pump switch - on.		21	02	4	3	3	
2411a.	35 *flap landing - announced (Capt).*		23	02	5	3	3	
2412a.	2 engine approach & land and go-around checklist review - ordered.		28	05	5	3	3	
2413a.	Response - Second Officer.		30	02	4	3	3	
2414a.	Airplane control - back to Captain.		32	02	5	3	2	
2415a.	Approach call re problem - ordered (Capt, F.O.).		34	02	5	3	2	
2416a.	Company call ordered - Captain (Pax info, fuel, emerg equip - S.O.).		42	08	5	2	3	
2417a.	Response - Second Officer.		44	02	4	2	3	
2418a.	ACARS VOX mode - select (S.O.).		46	02	4	2	3	
2419a.	ARINC - contact (S.O.).		49	03	4	2	3	
2420a.	Response - Chicago ARINC.		55	06	4	2	3	
2421a.	Request Dispatch contact - Second Officer.		57	02	4	2	3	
2422a.	Response - stand by.		59	02	4	2	3	
	FINAL APPROACH AND LANDING							
2423a.	Radar vector - left turn to 190° (approach).	15 30 59	15 31 00	01	4	2	2	
2424a.	Heading change acknowledged - First Officer.		02	02	3	3	2	
2425a.	Heading selector - set to 190°.		07	05	4	2	2	
2426a.	Auto pilot turns airplane to 190°	15 31 07	15 31 23	16	--	--	--	
2427a.	VOR 1 radio-tuned to 109.7, 14R ILS (Capt).	15 31 07	15 31 11	04	4	2	2	
2428a.	VOR 1 monitored for ident (ORD) - Captain.		15	04	4	2	2	
2429a.	Course selector 1 - set to 140° (ILS front course).		18	03	4	2	2	
2430a.	Radio call - dispatch.		19	01	--	--	3	
2431a.	Second Officer response - 1 engine shut down,		21	02	--	--	3	
2432a.	- approaching Chicago area,		23	02	--	--	3	
2433a.	- expect normal landing in about 10 minutes,		25	02	--	--	3	
2434a.	- passengers, 20, 1st - 15I, rear, 6 cabin crew.		27	02	--	--	3	
2435a.	- wheel chair pax row 9B & 18B.		29	02	--	--	3	
2436a.	- fuel, est. 24,000#, emerg. vehicles standing by.		31	02	--	--	3	
2437a.	Response - dispatch.		34	03	--	--	3	
2438a.	Captain - asks F.O. to tune VOR2 to ORD for DME info.	15 31 18	15 31 20	02	4	3	--	
2439a.	Approach plate - consult for ORD freq (F.O.).		30	10	3	3	--	
2440a.	VOR 2 - tuned to 113.9.		34	04	3	3	--	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2441a.	VOR 2 - monitored for ident. (ORD).	15	31	34	15	31	38			04	3	3	2	
2442a.	Captain - directs F.O. to fly while he reviews 2 eng. land & go around.						39			01	4	4	2	
2443a.	Captain - orders S.O. to read 2 eng landing and go around checks.						40			01	4	--	3	
2444a.	Check list - use normal 35 flap approach and speeds,						42			02	4	--	3	
2445a.	2nd engine fail plan - flaps 0/ext,						43			01	4	--	3	
2446a.	- accelerate to 15° flap speed (163kts data card),						44			01	4	--	3	
2447a.	- inhibit GPWS,						45			01	4	--	3	
2448a.	- center trim for landing,						46			01	4	--	3	
2449a.	Go around- apply thrust,						47			01	4	--	3	
2450a.	- flaps 22 (at this temp, otherwise 15),						48			01	4	--	3	
2451a.	- at positive rate, gear up,						49			01	4	--	3	
2452a.	- Climb at target approach or use GA mode.						50			01	4	--	3	
2453a.	First Officer - takes controls.	15	31	39	15	31	40			01	--	3	--	
2454a.	Speed brake handle - checked in retract position (F.O.).						42			02	--	4	--	
2455a.	Flap slat handle - set to 15 (F.O. Captain's order).						45			03	--	4	--	
2456a.	Flap handle position pointers - move to position 15.						46			01	--	4	--	
2457a.	Flap position indicator tapes - move to position 15.						48			02	--	4	--	
2458a.	Speed selector - set to 163 knots.						49			01	--	4	--	
2459a.	Auto throttles - adjust to slow to 163.						50			01	--	4	--	
2460a.	Captain - resumes flying.						51			01	4	2	2	
2461a.	Engine ignition selector - set to continuous B (S.O.).						54			03	4	2	3	
2462a.	Throttles - maintain 163 knots.					32	00			06	3	2	2	
2463a.	Radar vector & descent clearance - rt to 250° descend to 5,000'. (ORD).						05			05	4	3	2	
2464a.	Heading selector - set to 250°.						07			02	4	2	2	
2465a.	Vector and clearance - acknowledged (F.O.).						09			02	4	3	2	
2466a.	Altitude selector - set to 5,000' (F.O.).						12			03	3	3	2	
2467a.	Altitude selector - pull out.						14			02	3	3	2	
2468a.	FCS atm annunciator - shows ALT.						16			02	3	2	2	
2469a.	Vertical speed selector - set to 1,000 fpm down (Capt).						29			13	4	2	2	
2470a.	Auto pilot - descends airplane, 6 turns to 250°.						30			01	3	2	2	
2471a.	Auto throttle - adjusts to maintain 163 knots.						33			03	3	2	2	
2472a.	FCS pitch annunciator - shows VERT SPD.						35			02	3	2	2	
2473a.	Altitude - 5,750'.						45			10	3	2	2	
2474a.	Altitude alert light - on.						46			01	4	3	2	
2475a.	Altitude 5,250' descending.					33	15			29	3	2	2	
2476a.	Altitude alert light - off.						17			02	4	3	2	
2477a.	Altitude capture mode - engages.						22			05	3	2	2	
2478a.	FCS pitch annunciator - shows ALT CAP.						24			02	3	2	2	
2479a.	Auto pilot - levels airplane at 5,000'.						30			06	3	2	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
2480a.	Auto throttles - adjust to maintain 163 knots.	15	33	30	15	33	31			01	3	2	2	
2481a.	Altitude hold mode - engages.						32			01	3	2	2	
2482a.	FGS pitch annunciator - shows ALT HOLD.						33			01	3	2	2	
2483a.	Flaps 22, speed 153 - commanded by Captain.						35			02	4	3	2	
2484a.	Flap/slat handle - moved to position 22.						37			02	3	3	2	
2485a.	Flap handle position pointers - move to position 22.						38			01	3	3	2	
2486a.	Flap position indicator tapes - move to position 22.						40			02	3	3	3	
2487a.	Speed selector - set to 153 knots.						42			02	3	3	2	
2488a.	Auto throttles - adjust to slow to 153 knots.						45			03	3	2	2	
2489a.	Radar vector - turn left to 170°, this is						50			05	4	3	2	
2490a.	- your intercept heading,						52			02	4	3	2	
2491a.	- you are cleared for approach,						54			02	4	3	2	
2492a.	- cross SEXXY intersection at 4,000',						56			02	4	3	2	
2493a.	- contact tower on 118.1 over ROAMY.						58			02	4	3	2	
2494a.	Clearance acknowledged - First Officer.					34	00			02	3	3	2	
2495a.	Heading selector - set to 170°.						03			03	4	2	2	
2496a.	Auto pilot - turns airplane to 170°.	15	34	03	15	34	29			26	--	--	--	
2497a.	Altitude selector - set to 4,000'.	15	34	03	15	34	06			03	4	2	2	
2498a.	Altitude selector - pull out.						07			01	4	2	2	
2499a.	FGS arm annunciator - shows ALT.						08			01	3	2	2	
2500a.	Vertical speed selector - 1,000 fpm down (Capt).	15	34	08	15	34	10			02	4	2	2	
2501a.	Altitude - 4750' descending.						25			15	3	2	2	
2502a.	Altitude alert light - on.						27			02	4	3	2	
2503a.	Altitude - 4250' descending.						55			28	3	2	2	
2504a.	Altitude alert light - off.						56			01	4	3	2	
2505a.	Altitude capture mode - engage.						57			01	3	2	2	
2506a.	FGS pitch annunciator - shows ALT CAP.						59			02	3	2	2	
2507a.	FGS arm annunciator - goes blank.					35	00			01	3	2	2	
2508a.	Auto pilot - levels airplane at 4,000'.						10			10	3	2	2	
2509a.	FGS pitch annunciator - shows ALT HOLD.						12			02	3	2	2	
2510a.	Auto throttles - adjust to hold 153 knots.						15			03	3	2	2	
2511a.	ILS mode selector - press (Capt).						18			03	4	2	2	
2512a.	FGS arm annunciator - shows ILS.						20			02	3	2	2	
2513a.	*Gear down - ordered by Captain.*						22			02	4	3	2	
2514a.	*Gear handle - down* (F.O.).						24			02	3	3	2	
2515a.	Response - gear down (F.O.).						25			01	4	3	2	
2516a.	Gear indicator lights - red.						26			01	3	3	2	
2517a.	Gear indicator lights - green.						40			14	3	3	2	
2518a.	Brake pressure gages - indicate normal pressure.						42			02	3	3	2	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2519a.	Spoiler handle - raised to arm positon (F.O.).	15 35 42	15 35 45	03	3	3	3	
2520a.	Final descent checklist - ordered by Captain.		47	02	4	2	3	
2521a.	Final descent checklist - read by S.O. response as approp.		49	02	3	3	3	
2522a.	Ignition - continuous B (F.O.).		51	02	3	3	3	
2523a.	Flight and nav. instruments - x-checked, no flags (F.O.).		53	02	3	3	3	
2524a.	Gear - down, 3 green (F.O.).		55	02	3	3	3	
2525a.	Flaps - 22, take off light (F.O.).		57	02	3	3	3	
2526a.	Brake pressure - normal (F.O.).		59	02	3	3	3	
2527a.	Spoilers - armed (F.O.).		36 01	02	3	3	3	
2528a.	Annunciator lights - checked (F.O.,S.O.).		03	02	3	3	3	
2529a.	Checklist complete announcement - Second Officer.		04	01	4	2	3	
2530a.	#2 ADF/VOR selectors - ADF (Capt, F.O.).		05	01	4	3	2	
2531a.	#2 ADF pointer - indicating nearly at 140° bearing to ROAMY.		06	01	3	3	2	
2532a.	RSI #1 course deviation bar - moving toward center line.		08	02	4	3	2	
2533a.	Notification passing SEXXY - requested by Captain.		11	03	4	3	2	
2534a.	Response 14 miles on DME - First Officer.		13	02	4	3	2	
2535a.	Localizer capture mode - engages.		15	02	4	3	2	
2536a.	FGS steer annunciator - shows LOC CAP.		17	02	3	2	2	
2537a.	FGS arm annunciator - still shows ILS.		19	02	3	2	2	
2538a.	#2 VOR DME - indicates 14 nm from ORD (SEXXY).		19	--				
2539a.	Notification passing SEXXY - First Officer.		21	02	4	3	2	
2540a.	Vertical speed selector - 1,000 fpm down (Capt).	15 36 21	15 36 23	02	4	2	2	
2541a.	Request for altitude selector set to 2,400' - Captain.		25	02	4	3	2	
2542a.	Altitude selector - set to 2,400' (F.O.).		28	03	3	3	2	
2543a.	Altitude selector - pull out.		29	01	3	3	2	
2544a.	FGS arm annunciator - shows both ILS and ALT.		30	01	3	2	2	
2545a.	Vertical speed indicator - shows descent.		31	01	3	2	2	
2546a.	Altimeter - 3,150' descending.		37 00	29	3	2	2	
2547a.	Altitude alert light - on.		01	01	4	3	2	
2548a.	Altimeter - 2,650' descending.		30	29	3	2	2	
2549a.	Altitude alert light - off.		31	01	4	3	2	
2550a.	Altimeter - 2,500' descending.		36	05	3	2	2	
2551a.	DH (decision height) lights 1 & 2 - on.		37	01	4	3	2	
2552a.	DH lights - press (Capt, F.O.).		38	01	4	3	2	
2553a.	DH lights - off.		39	00.5	4	3	2	
2554a.	Altitude capture mode - engages.		39	00.5	3	2	2	
2555a.	FGS pitch annunciator - shows ALT CAP.		40	00.5	3	2	2	
2556a.	FGS arm annunciator - shows only ILS.		40	00.5	3	2	2	
2557a.	Auto pilot - levels airplane at 2,400'.		41	01	3	2	2	
2558a.	Localizer track mode - engages (below 2,500').		42	00.5	3	2	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2558a.	FGS steer annunciator - shows LOC TRK.	15	37	42	15	37	42			00.5	3	2	2	
2559a.	FGS pitch annunciator - shows ALT HOLD.						43			00.5	3	2	2	
2560a.	#1 RSI & ADI glide slope pointers - moving to center.						43			00.5	3	2	2	
2561a.	VHF radio #1 - tuned to 118.1 (ORD tower).						46			03	3	3	2	
2562a.	Request flaps 35 - Captain.						47			01	4	3	2	
2563a.	Flap handle - moved to position 35. (F.O.).						49			02	3	3	2	
2564a.	Flap handle position indicators - move to position 35.						50			01	3	3	2	
2565a.	Flap tapes - move to position 35.						53			03	3	3	3	
2566a.	Target approach speed - compute (threshold speed + wind correction)						55			02	4	3	2	
2567a.	Request speed selector set to 148 (133 +15) - Captain.						57			02	4	3	2	
2568a.	Speed selector - set to 148 (F.O.).						59			02	3	3	2	
2569a.	Auto throttles - adjust to reduce to and hold 148.						59			00	-	-	-	
2570a.	Glide slope capture mode - engages.						59			00	-	-	-	
2571a.	FGS pitch annunciator - shows GS CAP.						59			00	-	-	-	
2572a.	FGS arm annunciator - shows APP ONLY.						59			00	-	-	-	
2573a.	Auto pilot disconnect button - press (Capt).					38	00			01	6	3	3	
2574a.	Auto pilot disengage lights - flashing.						01			01	6	3	3	
2575a.	Auto pilot disengage button - press again.						02			01	6	-	3	
2576a.	Auto pilot disengage warning lights - off.						02			00	-	-	-	
2577a.	Auto throttle disengage buttons - press (Capt).						03			01	6	3	3	
2578a.	Auto throttle disengage lights - flashing.						04			01	-	3	3	
2579a.	Auto throttle disengage buttons - press again.						05			01	6	3	-	
2580a.	Auto throttle disengage warning lights - off.						05			00	-	-	-	
2581a.	ADF 2 pointer - moves to tail (passing ROAMY).	15	37	59	15	38	00			01	-	-	-	
2582a.	Marker beacon light and tone - on (passing ROAMY).						00			00	-	-	-	
2583a.	Passing ROAMY announcement - First Officer.	15	38	01	15	38	02			01	-	3	-	
2584a.	Announcement - target approach speed (Capt).	15	38	03	15	38	04			01	6	-	-	
2585a.	Altimeter - 2385' (S.O. confirms GS height at FAF).	15	38	04	15	38	05			01	-	-	3	
2586a.	Flight instruments & radios - monitor (S.O.).						06			01	6	2	3	
2587a.	Tower contact - First Officer at ROAMY.						07			01	6	3	3	
2588a.	Clearance to land - Chicago tower.						08			01	6	3	3	
2589a.	Wind - 150°/15 knots, gusts to 22 (ORD tower).						10			02	6	3	3	
2590a.	Clearance acknowledged - First Officer.						12			02	5	3	3	
2591a.	#2 VOR radio tuned to 109.7 (F.O.).						14			02	5	3	3	
2592a.	Altimeter - 1,667'.						15			01	5	3	3	
2593a.	Announcement - 1,000' AGL - First Officer.						17			02	6	3	3	
2594a.	Response - going to 867' barometric (Capt).						20			03	6	3	3	
2595a.	Altimeter - 1,167'.						53			33	5	3	3	
2596a.	Announcement - 500' AGL (F.O.).						55			02	6	3	3	
2597a.	Response - flaps 35 (Capt).						58			03	6	3	3	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	ACTION LEVEL F.O.	ACTION LEVEL S.O.	REMARKS
2598a.	Altimeter - 967'.	15	38	58	15	39	17			19	6	3	3	
2599a.	Announcement - approaching minimums (S.O.).						18			01	6	3	4	
2600a.	Altimeter - 867'.						24			06	6	3	3	
2601a.	Announcement - minimums (S.O.).						26			02	6	3	4	
2602a.	Radio altimeter - 50'.						52			26	5	3	3	
2603a.	Announcement - 50' (S.O.).						53			01	6	3	4	
2604a.	Radio altimeter - 30'.						56			03	5	3	3	
2605a.	Announcement - 30' (S.O.).						57			01	6	3	4	
2606a.	Radio altimeter - 10'.						58			01	5	3	3	
2607a.	Announcement - 10' (S.O.).						59			01	6	3	4	
2608a.	Landing struts compress - at touch down.					40	00			01	5	3	3	
2609a.	Throttles - idle (Capt).						01			01	6	3	3	
2610a.	Spoiler handle - moves full aft.						02			01	5	3	3	
2611a.	Spoiler indicator tapes - show full spoilers.						03			01	5	3	3	
2612a.	Control column - forward (Capt).						04			01	5	3	3	
2613a.	Nose strut - compressed (ground shift).						05			01	5	3	3	
2614a.	Engine idle rpm - reduces from flight idle.						05			--	-	-	-	
2615a.	Cabin outflow valve - opens.						05			--	-	-	-	
2616a.	#2 throttle interlock - releases.						05			--	-	-	-	
2617a.	Pitot heat amperage - reduces.						05			--	-	-	-	
2618a.	ACARS send light - on then off (on time rpt).						05			--	-	-	-	
2619a.	Landing gear safety down lock - engaged.	15	40	05	15	40	05			--				
2620a.	Throttle reverse levers - lifted to reverse range (Capt).						08			03	5	2	2	
2621a.	Brake pedals - depress (Capt)/						12			04	6	2	2	
2622a.	Reverse valve open lights - on.						13			01	6	2	3	
2623a.	Reverse unlock lights - on.						14			01	6	2	3	
2624a.	Reverse thrust lights - on.						15			01	6	2	3	
2625a.	Reverse unlock lights - off.						16			01	6	2	3	
2626a.	Reverse valve open lights - off.						17			01	6	2	3	
2627a.	N1 RPM - applied in reverse as necessary(Capt).						46			29	6	2	2	
2628a.	Airspeed - reducing.						47			01	5	2	2	
2629a.	Reverse levers - return to forward thrust, prior to 60 kts.						50			03	5	2	2	
2630a.	Reverse valve open lights - on.						51			01	3	2	3	
2631a.	Reverse unlock lights - on.						52			01	3	2	3	
2632a.	Reverse thrust lights - off.						53			01	3	2	3	
2633a.	Reverse unlock lights - off.						54			01	3	2	3	
2634a.	Reverse valve open lights - off.						55			01	3	2	3	
2635a.	Flight director switches - off (Capt, F.O.).						57			02	3	3	2	
2636a.	FGS annunciators - all go blank.						58			01	3	3	2	

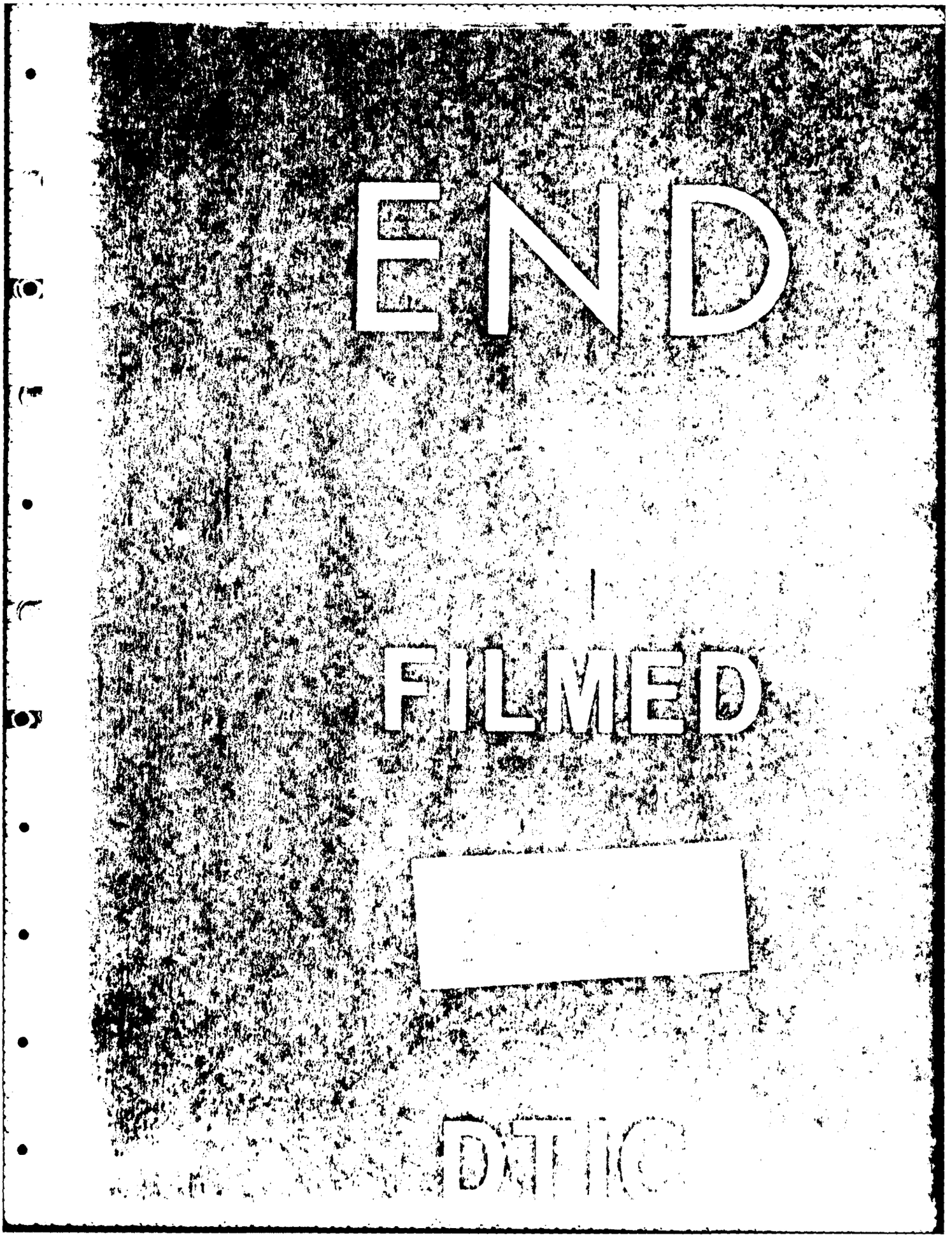
	DATA ITEM OR ACTION	START TIME			END TIME			DURATION		ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2637a.	Clearance to ground control on 121.9 (when able) - Chicago tower.					41	00		02	4	3	2	
	TAXI IN AND PARK PROCEDURES												
2638a.	Anti skid switch - off (Capt).	15	41	00	15	41	01		01	4		2	
2639a.	Anti skid fail annunciator lights - on.						02		01	3		2	
2640a.	Spoiler handle - depress.						03		01	4		2	
2641a.	Spoiler handle - returns to stowed position.						04		01	3		2	
2642a.	Spoiler indicator tapes - retract to zero.						04		--				
2643a.	Request flaps retracted - Captain.						06		02	4	3	2	
2644a.	Flap/slat handle - moved to up/retract position(F.O.).						09		03	3	3	2	
2645a.	Slat land light - off.						11		02	3		3	
2646a.	Slat disagree light - on.						12		01	3		3	
2647a.	Slat disagree light - off.						14		02	3		3	
2648a.	Flap tapes - move to zero.						15		01	3		3	
2649a.	HF radio switches - off (F.O.).	15	41	00	15	41	01		01		3		
2650a.	Widshield anti ice switches - off.						02		01		3		
2651a.	Windshield defog switches - off.						03		01		3		
2652a.	Pitot heat switch - off.						04		01		3		
2653a.	Engine anti ice switches - off.	15	41	09	15	41	10		01		3		
2654a.	DME 1 & 2 - stand by.						13		03		3		
2655a.	Radar - stand by.						15		02		3		
2656a.	INS data selector - track/ground speed.	15	41	15	15	41	17		02	4	3		
2657a.	Safe taxi speed - mintain (using INS).						20		03	3	3		
2658a.	ACARS VOX mode - select (S.O.).	15	41	15	15	41	17		02			3	
2659a.	Chicago ramp - contact to confirm gate E 11 W.						20		03			3	
2660a.	Response - gate confirmed, &						22		02	3	2	3	
2661a.	wheel chairs waiting.						24		02	3	2	3	
2662a.	Captain notified gate E 11 W confirmed - Second Officer.						26		02	4	2	3	
2663a.	ACARS data mode - selected.						28		02	3	2	3	
2664a.	VHF radio 1 - tuned to 121.9.						33		05	3	3	2	
2665a.	Chicago ground - contact (F.O.).						36		03	3	3	2	
2666a.	Cleared left at next high speed, &						39		03	4	3	2	
2667a.	hold short of outer taxi way - Chicago ground.						41		02	4	3	2	
2668a.	Clearance acknowledged - First Officer.						43		02	3	3	2	
2669a.	Brake pressure - checked normal (F.O., S.O.).						45		02	3	3	3	
2670a.	APU oil quantity - checked normal (4 quarts minimum).						47		02	3	2	3	
2671a.	APU master switch - on (S.O.).						49		02	3	2	3	
2672a.	APU door open light - on.					42	09		20	3	2	3	
2673a.	APU master switch - start/run.						11		02	3	2	3	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2674a.	APU oil pressure low light - on.	15	42	11	15	42	12			01	3	2	3	
2675a.	APU generator off light - On.						13			01	3	2	3	
2676a.	N2 RPM - increasing.						14			01	3	2	3	
2677a.	EGT - increasing.						29			15	3	2	3	
2678a.	N1 - increasing!						30			01	3	2	3	
2679a.	N2 RPM - increasing through 50%.						45			15	-	-	3	
2680a.	APU oil pressure low light - off.						46			01	-	-	3	
2681a.	APU generator off light - off.						50			04	-	-	3	
2682a.	APU power available light - on.						53			03	-	-	3	
2683a.	APU generator bus switches 1, 2 & 3 - on (S.O.).						54			01	-	-	3	
2684a.	Galley power & coffee bar switches - off.						57			03	-	-	3	
2685a.	Turn off to taxi way - Captain.	15	42	30	15	42	57			27	4	2	-	
2686a.	Cabin outflow valve - verify full open (S.O.).					43	00			03	-	-	3	
2687a.	Cabin vertical speed - zero.						02			02	-	-	3	
2688a.	Cabin altitude - approx. 667'.						04			02	-	-	3	
2689a.	Log book - open (S.O.).						12			08	-	-	3	
2690a.	Notify Captain airplane blocking taxi way - First Officer.	15	42	57	15	43	04			07	4	3	-	
2691a.	Throttles - close (Csot).						07			03	4	2	-	
2692a.	Brakes - on (holding position until clear to cross).						12			05	4	2	-	
2693a.	Hydraulic motor pumps - off.						16			04	3	2	3	
2694a.	Transponder - standby (F.O.).						19			03	3	3	2	
2695a.	Rudder standby power - off.						22			03	3	2	3	
2696a.	Hydraulic cue light - on.						24			02	3	2	3	
2697a.	Master caution light - on.						26			02	3	2	3	
2698a.	Hydraulic cue light - press (S.O.).						31			05	3	2	3	
2699a.	Master caution and cue lights - off.						36			05	3	2	3	
2700a.	Radio call - American you are blocking the taxiway, pull up (chicago gnd).						41			05	3	2	2	
27D1a.	Response - sorry, moving (American).						46			05	3	2	2	
2702a.	Clearance to cross outer taxi way.- Chicago ground.					44	55		01	09	3	2	3	
2703a.	Clearance to cross - acknowledged (F.O.).						58			03	4	3	2	
2704a.	Notify Captain truck approaching on ramp - First Officer.					45	06			08	4	3	2	
2705a.	*Traffic acknowledged - Captain.*						08			02	4	3	2	
2706a.	Request gate chart - Captain.						10			02	4	3	2	
2707a.	Consult gate chart for orientation on ramp - Captain.						35			25	4	3	2	
2708a.	Gate in view - Capt/F.O.						36			01	4	3	2	
2709a.	Man at gate - in view.						37			01	4	3	2	
2710a.	Lead in lights - in view.						38			01	4	3	2	
2711a.	*Steer to align red and green lead in lights - Captain.*						50			12	4	3	2	

	DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2712a.	Brakes - on so as to stop at red alignment lights (Capt).	15 45 50	15 45 52	02	4	2	2	
2713a.	Brake pedals - depress and hold.		53	01	3	1	1	
2714a.	Parking brake lever - pull aft and hold.		54	01	2	1	1	
2715a.	Brake pedals - release.		55	01	1	1	1	
2716a.	Parking brake lever - release.		56	01	1	1	1	
2717a.	Park brake on lights - on.		57	01	1	1	1	
2718a.	Seat belt sign switch - off.		59	02	2	1	1	
2719a.	Stabilizer trim handles - hold forward.		46 00	01	2	1	1	
2720a.	Stabilizer trim ind. - moves to top of green band.		01	01	2	1	1	
2721a.	Trim handles - release.		02	01	2	1	1	
2722a.	Engine bleed switches - *off* (S.O.).		04	02	2	2	2	
2723a.	INS 1 & 2 way point change switches - press.		06	02	2	2	1	
2724a.	Keys 1 & 9 press (Capt & F.O.).		08	02	2	2	1	
2725a.	From/to windows - show 1/9.		10	02	2	2	1	
2726a.	Data selectors 1 & 2 - stat/time.		12	02	2	2	;	
2727a.	Displays - show distances Ø1 - 2 nm & Ø2 1 nm. (log if over 25 nm).		14	02	2	2	1	
2728a.	Data selectors - XTK/TKE.		16	02	2	2	1	
2729a.	*Displays - show 3 & 5 nm (log if over 25 nm).*		18	02	2	2	1	
2730a.	INS mode selectors 0 off.		21	03	2	2	1	
2731a.	Request of S.O. is ready for shut down - Captain.		23	02	2	1	2	
2732a.	Response - yes (cool down time sufficient).		25	02	2	1	2	
2733a.	Shut down 1 & &. - Captain.		27	02	2	2	1	
2734a.	1 & â fuel levers - off (F.O.).		32	05	1	2	1	
2735a.	1 & â generator off lights - on.		36	04	1	1	2	
2736a.	1 & â APU power in use lights - on.		37	01	1	1	2	
2737a.	Engines - not running		39	01	1	1	1	
2738a.	APU isolation valve switch - open.		41	02	1	1	2	
2739a.	1, 2 & 3 flow meters - normal.		44	03	1	1	2	
2740a.	Airconditioning - checked.		46	02	1	1	2	
2741a.	Cabin door lights - check all on (doors disarmed).		48	02	1	1	2	
2742a.	ACARS data mode - selected.		50	02	1	1	2	
2743a.	Fuel quantity totalizer - reads 24,200#.		52	02	1	1	2	
2744a.	Fuel/landing key - press (S.O.).		53	01	1	1	2	
2745a.	Fuel/landing key light - on.		54	01	1	1	2	
2746a.	Data display - shows FO (fuel on board).		55	01	1	1	2	
2747a.	Keys 2, 4 & 2 - press!		57	02	1	1	2	
2748a.	Data display - shows 242 (24,200#).		58	01	1	1	2	
2749a.	Enter key - press.		59	01	1	1	2	
2750a.	Data display - shows LA.		47 00	01	1	1	2	
2751a.	Key 1 (Captain landed) - press.		01	01	1	1	2	

	DATA ITEM OR ACTION	START TIME			END TIME			DURATION			ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2752d.	Data display - shows 1.	15	47	01	15	47	01			--				
2753a.	Enter key - press.						02			01	1	1	2	
2754a.	Fuel/landing key light - off.						03			01	1	1	2	
2755a.	Send key - press.						04			01	1	1	2	
2756a.	Send key light - on then off.						05			01	1	1	2	
2757a.	ACARS - transmits in time, fuel & pilot at controls.						05			--				
2758a.	1 & 3 CSD oil pressure low lights - on.						06			01	1	1	2	
2759a.	Electric cue light - on.						06			--				
2760a.	Master caution lights - on.						07			01	1	1	2	
2761a.	Electrical cue light - press.						08			01	1	1	2	
2762a.	Cue and caution lights - off.						09			01	1	1	2	
2763a.	Checklist - read by First Officer, response by approp. crew member.						10			01	1	1	1	
2764a.	Parking brake - set.						12			02	2	1	1	
2765a.	Radar - off.						14			02	2	1	1	
2766a.	Transponder - standby.						16			02	2	1	1	
2767a.	Spoilers & flaps - retracted.						18			02	2	1	1	
2768a.	Fuel levers - off.						20			02	2	1	1	
2769a.	Emergency light switch - off.						22			02	2	1	1	
2770a.	Ignition - off.						24			02	2	1	1	
2771a.	HF radios - off.						26			02	2	1	1	
2772a.	IRS - off.						28			02	2	1	1	
2773a.	Pitot heat - off.						30			02	2	1	1	
2774a.	Motor pumps and aux pumps - off.						32			02	1	1	2	
2775a.	Rudder standby power - off						34			02	1	1	2	
2776a.	Air conditioning - checked.						36			02	1	1	2	
2777a.	Tank pumps - off except one for the APU.						38			02	1	1	2	
2778a.	Cabin door annunciator lights - all on.						40			02	1	1	2	
2779a.	Windshield anti ice/defog switches - off.						42			02	2	1	1	
2780a.	Battery switch - on (APU running).						44			02	1	1	2	
2781a.	Cockpit and exterior lights - off (Capt, S.O. & F.O.).						47			03	2	2	2	
2782a.	External power available light - on.						49			02	1	1	2	
2783a.	1 & 2 engine driven hyd pump pressure low lights - on						50			01	1	1	2	
2784a.	Hydraulic cue light - on.						51			01	1	1	2	
2785a.	Master caution lights - on.						53			02	1	1	2	
2786a.	Hydraulic cue light - press.						54			01	1	1	2	
2787a.	Cue and caution lights - off.						57			03	1	1	2	
2788a.	Pack switches - check on.						58			01	1	1	2	
2789a.	1-2 & 1-3 isolation valve switches - check normal.						59			01	1	1	2	
2790a.	1-2 & 1-3 isolation valve disagree lights - off.					48	00			01	1	1	2	

DATA ITEM OR ACTION	START TIME	END TIME	DURATION	ACTION LEVEL CAP.	F.O.	S.O.	REMARKS
2791a. External power switch - on.	15 48 00	15 48 02	02	1	1	2	
2792a. External power in use light - on.		03	01	1	1	2	
2793a. APU isolation valve switch - closed.		05	02	1	1	2	
2794a. APU generator bus switches 1, 2 & 3 - off.		10	05	1	1	2	
2795a. AC bus tie isolate lights - out.		11	01	1	1	2	
2796a. APU master switch - off.		13	02	1	1	2	
2797a. Yellow capped circuit breakers - pull out.		28	15	1	1	2	
2798a. APU clock time - entered in log.		30	02	1	1	2	
2799a. Landing station - entered in log.		32	02	1	1	2	
2800a. Landing fuel - entered in log.		35	03	1	1	2	
2801a. Off time - entered in log.		37	02	1	1	2	
2802a. On time - enetered in log.		39	02	1	1	2	
2803a. Required service - entered in log.		44	05	1	1	2	
2804a. Auto pilot approach info - entered in log.		47	03	2	1	2	
2805a. INS accuracy data - entered in log.		50	03	2	1	2	
2806a. Log book - signed by Captain.		49 00	10	2	1	1	
2807a. APU - shuts down (90 seconds after APU isol valve closed).		35	35	1	1	1	
2808a. Crew departs airplane.		15 50 00	25	1	1	1	


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